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NIKOLAUS S. OBRAZTSOV †. — Die Gattungen der Palaearktischen Tortricidae. II. Die Unterfamilie Olethreutinae. 8. Teil und Schluss. Mit einem Gesamtregister zu allen Teilen, zusammengestellt von B. J. LEMPKE, p. 1—48, Abb. 1—5 und Tafeln 1—11.

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DIE GATTUNGEN DER PALAEARKTISCHEN TORTRICIDAE

II. DIE UNTERFAMILIE OLETHREUTINAE

8. Teil und Schluss *)

VON

NIKOLAUS S. OBRAZTSOV † **)

(Mit Abbildungen 1—5 und Tafeln 1—11)

mit

einem Gesamtregister zu allen Teilen
zusammengestellt von

B. J. LEMPKE
Amsterdam

Abstract

The present and last instalment of the second volume of the Revision contains a survey of the genus *Eucosma* Hübner, 1823, divided into four subgenera: *Eucosma* Hübner, 1823, *Pygolopha* Lederer, 1859, *Palpocrinia* Kennel, 1919 and *Phaneta* Stephens, 1852. Of these subgenera 48, 1, 1, and 69 species, respectively, are enumerated. A commentary dealing with 10 species, is added.

A general alphabetical index to all parts of the Revision, starting with vol. 97, part 3 (1954) of this journal is attached, compiled by B. J. Lempke (p. 22), together with a list of posthumous papers of Dr. Obraztsov (p. 48).

88. Gattung Eucosma Hb., 1823

Typus generis (monotyp.): *Eucosma circulana* Hb., 1823

Phalaena Tortrix (part.): Linné, 1761, Fauna Suec.: 349.
?Phalaena (part.): Scopoli, 1763, Ent. Carn.: 234.
?Pyralis (part.): Fabricius, 1798, Suppl. Ent. Syst.: 476.
Tortrix (part.): Haworth, 1811, Lep. Brit.: 455.
?Tinea (part.): Charpentier, 1821, Zinsler etc.: 120.
Olethreutes (part.): Hübner, 1822, Syst.-alph. Verz.: 58.
Eucosma Hübner, 1823, Zutr. Samml. Exot. Schm. 2: 28.
Cydia (part.): Hübner, 1825, Verz. bek. Schm.: 375.
Epiblema (part.): Hübner, 1825, op. cit.: 375.
Ernarmonia (part.): Hübner, 1825, op. cit.: 375.
Anchylopera (part.): Stephens, 1829, Syst. Cat. Brit. Ins. 2: 178.
?Aphelia (part.): Stephens, 1829, op. cit.: 180.
Semasia (part.): Stephens, 1829, op. cit.: 180.
Eupoecilia (part.): Stephens, 1829, op. cit.: 191.
Grapholita (part.): Treitschke, 1829, Schm. Eur. 7: 232.
Penthina (part.): Treitschke, 1830, Schm. Eur. 8: 26.

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*) Dieser Teil der Revision wurde mit Unterstützung des U.S. National Science Foundation zur Publikation vorbereitet.

**) Im Leben: Research Associate, American Museum of Natural History, New York, U.S.A. Für eine Liste von posthumer Publikationen Dr. Obraztsov's siehe Seite 48.

Gattung *Eucosma* Hb. Abb. 1, *E.* (*E.*) *circulana* Hb., Männchen, Kopf; Abb. 2, Geäder; Abb. 3—4, weibliche Genitalien; Abb. 5, männliche Genitalien.

Grapholitha (part.): Treitschke, 1830, op. cit.: 204.
Cochylis (part.): Treitschke, 1830, op. cit.: 277.
Carpocapsa (non Tr.): Curtis, 1831, Brit. Ent.: expl. t. 352.
Anticlea (part.): Stephens, 1834, Illustr. Brit. Ent., Haust. 4: 114.
Carpocapsa (*Epiblema*): Stephens, 1834, op. cit.: 122.
?*Bactra* (part.): Stephens, 1834, op. cit.: 125.
Phoxopteris (non Tr.): Zetterstedt, 1840, Ins. Lap.: 987.
Teras (non Tr.): Eversmann, 1840, Fauna Lepid. Volgo-Ural.: 520.
Paedisca (part.): Freyer, 1842, Neue Beitr. Schm.kunde 4: 48.
?*Peronea* (part.): Duponchel, 1845, Cat. Méth. Lép. Eur.: 291.
Antithesia (part.): Duponchel, 1845, op. cit.: 296.
Catoptria Guenée, 1845, Ann. Soc. Ent. France (2) 3: 187. Typus generis (selectus): *Tortrix cana* Hw., 1811 (= *Catoptria carduana* Gn., 1845) (Fernald, 1908, Gen. Tortr.: 33). Nom. praeocc. per *Catoptria* Hb., 1825, Crambidae.
Philalcea (part.): Westwood & Humphreys, 1845, Brit. Moths 2: 132.
?*Ablabia* (part.): Westwood & Humphreys, 1845, op. cit.: 140.
Phaneta Stephens, 1852, List. Specim. Brit. Anim. 10: 32. Typus generis (monotyp.): *Cochylis pauperana* Dup., 1843.
Lithographia (*Notocelia*) (part.): Stephens, 1852, op. cit.: 34.
Grapholita ! (*Cydia*) (part.): Stephens, 1852, op. cit.: 93.
Pygolopha Lederer, 1859, Wien. Ent. Mschr. 3: 123, 279. Typus generis (monotyp.): *Penthina lugubrana* Tr., 1830 (= *Pygolopha tinacriana* Ld., 1859).
Grapholitha (*Paedisca*) (part.): Lederer, 1859, ibid.: 332.
Grapholitha (*Coccyx*) (part.): Lederer, 1859, ibid.: 278.
Calosetia Stainton, 1859, Man. Brit. Butt. & Moths 2: 271. Typus generis (monotyp.): *Tortrix nigromaculana* Hw., 1811.
Ioplocama Clemens, 1860, Proc. Acad. Nat. Sci. Philad.: 360. Typus generis (monotyp.): *Ioplocama formosana* Clem., 1860.
Poecilochroma (non Stph.): Clemens, 1860, ibid.: 353.
Affa Walker, 1863, List Specim. Lepidopt. Ins. 27: 202. Typus generis (monotyp.): *Affa bipunctella* Wkr., 1863.
Grapholitha (*Semasia*) (part.): Heinemann, 1863, Schm. Dtschl. u. Schweiz (2) 1 (1): 166.
Steganoptycha (non Stph.): Clemens, 1865, Proc. Ent. Soc. Philad. 5: 137.
Conchylis (non Sod.): Robinson, 1869, Trans. Amer. Ent. Soc. 2: 284.
Exentera Grote, 1877, Canad. Ent. 9: 227. Typus generis (monotyp.): *Exentera apriliana* Grote, 1877.
Rhyacionia (part.): Walsingham, 1879, Illustr. Lep. Het. B.M. 4: 75.
Exenterella Grote, 1883, Canad. Ent. 15: 23. Typus generis (heredit.): *Exentera apriliana* Grote, 1877. Nom. substit. pro *Exentera* Grote, 1877.
Crambus (non F.): Hulst, 1886, Trans. Amer. Ent. Soc. 33: 166.
Thiodia (part.): Walsingham, 1897, Proc. Zool. Soc. Lond.: 125.
Phtheochroa (ex. err.): Aigner-Abafi, 1898, Illustr. Zschr. Ent. 3: 312.
Epinotia (part.): Fernald, 1903, Bull. U.S. Nat. Mus. 52 (1902): 464.
Proteopteryx (non Wlsm.): Kearfott, 1907, Canad. Ent. 39: 155.
Enarmonia (part.): Barnes & McDunnough, 1917, Check List Lepid. Boreal Amer.: 173.
Palpocrinia Kennel, 1919, Mitt. Münchn. Ent. Ges. 8: 66. Typus generis (monotyp.): *Palpocrinia ottoniana* Kenn., 1919. synon. nov.
Ancylis (non Hb.): Meyrick, 1922, Exot. Micr. 2: 514.
Phaneta (*Semasia*): Benander, 1928, Ent. Tidskr. 29: 142.
Catoptria (*Phaneta*): Obraztsov, 1946, Zschr. Wien. Ent. Ges. 30: 39.
Eucosmoides Obraztsov, 1946, ibid.: 38. Typus generis (monotyp. design.): *Paedisca decolorana* Frr., 1842.
Catoptria (*Semasia*): Jäckh, 1953, Zschr. Lepid. 3: 43.
Eucosma (*Phaneta*): Hannemann, 1961, Dahls Tierw. Dtschl. 48, Kleinschm. 1: 123.
Eucosma (*Catoptria*): Kouznetzov, 1962, Bull. Soc. Ent. Mulhouse: 55.

Der Gattung *Epiblema* bis auf Folgendes ähnlich. Thorax glatt. Vorderflügel (Abb. 2) meistens nicht breit, distal ganz unwesentlich erweitert; Termen mäßig schräg, gerade oder zwischen den Adern M_1 und Cu_1 leicht eingezogen; Costalumschlag beim Männchen nicht stets vorhanden. Die Vorderflügelader S mehr oder weniger gerade, meistens ziemlich kurz; R_1 entspringt an oder kurz vor der Mitte der Mittelzelle; R_2 viel näher zu R_3 als zu R_1; Innenader der Mittelzelle entspringt zwischen R_1 und R_2 oder fehlt; Adern R_5 bis M_3 etwa gleich weit auseinander gestellt; Cu_1 der M_3 stark genähert, verläuft dieser parallel, oder ist in der Mitte mehr oder weniger von dieser entfernt; Cu_2 entspringt kurz vor dem letzten Drittel der Mittelzelle; Basalgabel $A_2 + 3$ bis ein Drittel so lang wie die ganze Ader. Hinterflügel (Abb. 2) mit Costa im zweiten basalen Drittel leicht aufgebogen, dann etwas absteigend und in ihrem ganzen Verlauf gerade, oder fast gerade; Termen sanft konvex oder ziemlich flach. Die Ader S ganz sanft eingebogen; M_3 und Cu_1 gestielt oder zusammenfallend; Cu_2 entspringt kurz vor dem letzten Viertel der Mittelzelle.

Männliche Genitalien (Abb. 5). Valva ohne Pulvinus; Aedoeagus in der Regel ziemlich plump, dick und verhältnismäßig kurz. Weibliche Genitalien (Abb. 3—4). Apophyses posteriores kürzer als die Apophyses anteriores; Ostium bursae liegt in einem mehr oder weniger tiefen Ausschnitt des Caudalrandes der Ventralplatte; Lamella postvaginalis länglich, aus diesem Ausschnitt mehr oder weniger weit caudal hervortretend; kein Antrum vorhanden; Signa manchmal zu einem Stück reduziert oder fehlen.

Eucosma ist eine sehr artenreiche Gattung, die größte unter den Olethreutinae, und sie hat ihre Vertreter in allen faunistischen Gebieten. Trotz ihres großen Umfanges ist diese Gattung in ihren morphologischen Merkmalen doch ziemlich einheitlich und diese variieren nur unbedeutend von Art zu Art oder individuell. Sogar die übliche Aufteilung der *Eucosma*-Arten in drei Gattungen (*Eucosma, Pygolopha* und *Phaneta* = *Thiodia* auct., non Hb.) erwies sich nicht als gerechtfertigt und diese Gruppen sind nur mehr von subgenerischem Werte. Heinrich (1923) vermutete die Möglichkeit einer weiteren Aufteilung der *Eucosma* in kleinere systematische Gruppen, hauptsächlich auf Grund der Cucullus-Form, aber bis jetzt gelang es nur *Pelochrista* Ld. als eine besondere Gattung abzutrennen.

Die Artunterschiede der äußeren morphologischen Merkmale sind in *Eucosma* meistens ganz unbedeutend und öfters zeigen sie Übergänge, die durch die infraspezifische Variabilität stark verdunkelt sind, wie z.B. der Abstand zwischen den Vorderflügeladern R_1 bis Cu_1 oder die Ursprungsstelle der Innenader der Mittelzelle, die bald R_1, bald R_2 näher steht und bisweilen fehlt die Ader sogar. Die von Kennel (1908, 1916) für *lugubrana* angegebene starke Ausbiegung des mittleren Teils der Vorderflügelader Cu_1, ihre Verkürzung und Krümmung beim Männchen in der Richtung zu M_3 ohne den Saum zu erreichen, erwies sich von rein individueller Natur und tritt, obwohl seltener, auch in den anderen *Eucosma*-Arten auf. Die Hinterflügeladern R und M_1 können bei ein und derselben Art entweder dicht beisammen entspringen oder gestielt sein. Der gemeinsame Stiel der Hinterflügeladern M_3 und Cu_1 ist manchmal an den beiden Flügeln ein und desselben Falters ungleich lang und kann zu einer vollständigen Verschmelzung dieser Adern führen. Ausnahmsweise kann diese Verschmelzung nur auf einem Hinterflügel geschehen. Als ein atavistisches Merkmal wurden bei einem *lacteana*-Männchen im A.M.N.H. die Hinterflügeladern M_3 und Cu_1 an der Basis als deutlich getrennt, in der Mitte verschmolzen und gegen den Saum wieder getrennt beobachtet. Durchschnittlich sind die äußeren Merkmale artlich ziemlich beständig, aber bei mehreren, nicht unbedingt

nahe verwandten Arten ganz gleich und deshalb für diagnostische Zwecke meistens wenig geeignet. Die Genitalunterschiede sind bei den *Eucosma*-Arten nicht immer auffallend, aber zusammen mit der Vorderflügelzeichnung diagnostisch sehr wichtig.

Larvalmorphologisch sind die *Eucosma*-Arten noch ganz ungenügend erforscht (Swatschek, 1958). Trotzdem können ihre Raupen von denen der *Pelochrista* meistens dadurch unterschieden werden, daß bei *Eucosma* die Borstengruppe III am 8. Abdominalsegment ventrocranial vom Stigma oder mit diesem in gleicher Höhe steht. Die Borsten II sind bei *Eucosma* an demselben Segment weiter auseinander gestellt als die Borsten I. Die Unterschiede den *Epiblema*-Raupen gegenüber sind bei der Besprechung dieser letzteren Gattung näher erörtert worden. Die von MacKay (1959) veröffentlichten Ergebnisse über die wenigen von ihr untersuchten nordamerikanischen *Eucosma*-Raupen, die sie zwischen *Eucosma* und *"Thiodia"* aufteilte, zeigen, daß eine gemeinsame larvalmorphologische Charakteristik der ganzen Gattung vorläufig noch sehr kompliziert ist. Sie teilte die *"Eucosma"*-Arten in drei Gruppen und die *"Thiodia"*-Arten sogar in vier Gruppen, die, nach der Ansicht dieser Verfasserin, eine geringe Verwandtschaft zeigen. Von diesen erwies sich die 1. *"Eucosma"*-Gruppe, deren Raupen auf den Coniferen leben, von den übrigen zweien besonders unterschieden. Die Raupen der letzteren fressen an verschiedenen Kräutern, an welchen sie in den Wurzeln und Stengeln bohren. In der 1. Gruppe ist die Spindelspitze abgerundet, während sie in zwei anderen Gruppen deutlich zugespitzt ist. Außerdem sind die Raupen der 1. Gruppe durch das Vorhandensein einer zusätzlichen Borste (IVa) auf dem 1. bis 7. Abdominalsegment charakterisiert. Die Entdeckung dieser Borste ist besonders interessant, da Swatschek (1958) sie bei den europäischen Arten nur in den Gattungen *Rhyacionia* und *Clavigesta* gefunden hat. Was den taxonomischen Wert der von MacKay aufgestellten *"Eucosma"*-Gruppen betrifft, so ist die 1. Gruppe auch imaginalmorphologisch begründet und umfaßt genitaliter ziemlich einheitlich gebaute Arten, die trotzdem generisch nicht zu trennen sind. Dagegen erscheint die 2. Gruppe ganz bunt und enthält auch manche *Pelochrista*-Arten. Die Arten der 3. Gruppe sind von der 2. Gruppe imaginalmorphologisch nicht abtrennbar. Die Aufteilung der *"Thiodia"*-Arten in vier Raupengruppen findet auch wenig Unterstützung in der Imaginalmorphologie.

Wie oben gesagt, können die *Eucosma*-Arten nach ihren imaginalen Merkmalen in drei Untergattungen aufgeteilt werden. Dazu kommt noch *Palpocrinia* als die vierte Untergattung. Diese letztere wurde zunächst als eine eigene, aus einer einzigen Art bestehende und nur in einem männlichen Exemplare bekannte Gattung aufgestellt, unter den Tortricinae eingereiht (Kennel, 1919), später (Obraztsov, 1955) unter den Cnephasiini untergebracht und endlich (Obraztsov, 1965) richtig für eine Eucosmine anerkannt. Die vier *Eucosma*-Untergattungen sind wie folgt charakterisiert:

1. Untergattung *Eucosma* Hb. s. str. (Typus subgeneris: *Eucosma circulana* Hb., 1823; eine nearktische Art). Vorderflügel des Männchens mit einem Costalumschlag. Hinterleibspitze des Weibchens einfach.

2. Untergattung *Pygolopha* Ld. (Typus subgeneris: *Penthina lugubrana* Tr., 1830). Vorderflügel wie in der vorigen Untergattung. Hinterleibspitze des Weibchens mit einem rundlichen Schuppenschopf.

3. Untergattung *Palpocrinia* Kenn., status nov. (Typus subgeneris: *Palpocrinia ottoniana* Kenn., 1919). Vorderflügel des Männchens ohne Costalumschlag, aber mit einem Haarbüschel an der Costa-Basis. Kopf, Labialpalpen, Tegulae und Unterseite des Thorax sehr lang behaart (Obraztsov, 1955: 163, fig. 279; 1956: 117; 1965: 25).

4. Untergattung *Phaneta* Stph. (Typus subgeneris: *Cochylis pauperana* Dup., 1843). Vorderflügel in beiden Geschlechtern ohne besondere Auszeichnungen. Beschuppung des Kopfes, Körpers und ihrer Teile normal.

KATALOG DER PALAEARKTISCHEN *EUCOSMA*-ARTEN

Sg. Eucosma Hb., 1823

E. (E.) sordicomana (Stgr.) comb. nova*
sordicomana Staudinger, 1859, Stett. Ent. Ztg. 20: 232 (*Grapholitha*). — Staudinger & Rebel, 1901: 117, No. 2096; Kennel, 1921: 571, t. 21 fig. 53 (♀); diese Arbeit: Taf. 1 Fig. 1 (♂-Genitalien). — Iberische Halbinsel.

E. (E.) obesana (Kenn.) comb. nova
obesana Kennel, 1901, Iris 13 (1900): 284 (*Epiblema*). — Staudinger & Rebel, 1901: 263, No. 2102*bis*; Kennel, 1921: 571, t. 21 fig. 54 (♀). — Andalusien.

E. (E.) medullana (Stgr.) comb. nova*
medullana Staudinger, 1879, Horae Soc. Ent. Ross. 15: 254 (*Grapholitha*). — Staudinger & Rebel, 1901: 115, No. 2071; Kennel, 1921: 550, t. 21 fig. 7 (♂); diese Arbeit: Taf. 1 Fig. 2 (♂-Genitalien). — Bulgarien; Mazedonien; Kleinasien; Syrien.

E. (E.) conformana (Mn.) comb. nova* (1)
conformana Mann, 1872, Verh. zool.-bot. Ges. Wien 22: 36 (*Grapholitha*); *significantana* Kennel, 1901, Iris 13 (1900): 282 (*Epiblema*). — Staudinger & Rebel, 1901: 121, No. 2175; 263, No. 2083*bis* (als *significantana*); Kennel, 1921: 567, t. 21 fig. 43, 44 (♂♀); Hannemann, 1961: 126 nota, 220 fig. (♂-Genitalien), t. 21 fig. 23 (Falter); diese Arbeit: Taf. 1 Fig. 3, Taf. 2 Fig. 1 (♂♀-Genitalien). — Ungarn; Kroatien; Dalmatien; Kärnten; Mazedonien; Griechenland; Kleinasien; Syrien; Palästina.

E. (E.) clarescens Kuzn.*
clarescens Kuznetzov, 1964, Trudy Zool. Inst. Akad. Nauk SSSR 34: 264, fig. 6 (♂♀-Genitalien) (*Eucosma*). — Ostrußland (Provinz Uralsk).

E. (E.) jerusalemana (Ams.) comb. nova*
jerusalemana Amsel, [1933, Zoogeogr. 2: 123; nom. nud.], 1935, Mitt. Zool. Mus. Berlin 20: 291, t. 11 fig. 87 (Falter), t. 17 fig. 62 (♂-Genitalien) (*Epiblema*); diese Arbeit: Taf. 2 Fig. 3. — Palästina; Iran.

E. (E.) persiae Raz.
persiae Razowski, 1963, Acta Zool. Cracov. 8: 256, fig. 5—8 (Kopf, Vorderflügel, ♂♀-Genitalien) (*Eucosma*). — Südwestiran.

E. (E.) gypsatana (Kenn.) comb. nova* (2)
gypsatana Kennel, 1921, Pal. Tortr.: 557, t. 21 fig. 25 (*Epiblema*). — Diese Arbeit: Taf. 1 Fig. 4 (♂-Genitalien). — Kleinasien.

E. (E.) albuneana (Z.) comb. nova
albuneana Zeller, 1847, Isis: 725 (*Paedisca*); *albuncana* (err. typogr.): Lederer, 1859, Wien. Ent. Mschr. 3: 332 (*Grapholitha, Paedisca*). — Staudinger & Rebel, 1901: 116, No. 2079; Kennel, 1921: 557, t. 21 fig. 24 (♂); diese Arbeit: Taf. 3 Fig. 1 (♀-Genitalien). — Südfrankreich; Spanien; Sardinien; Sizilien; Dalmatien; Istrien; Rumänien; Südrußland; Nordwestafrika.

E. (E.) albarracina Hartig (3)
albarracina Hartig, 1941, Mitt. Münchn. Ent. Ges. 31: 156, t. 6 fig. 5 (*Eucosma*). — Spanien (Albarracin).

E. (E.) lacteana (Tr.)
lacteana Treitschke, 1835, Schm. Eur. 10 (3): 113, 256 (*Grapholitha*); *lacteanum*: Meyer, 1901, Kranchers Ent. Jahrb. 18: 148 (*Epiblema*). — Staudinger & Rebel, 1901: 116, No. 2081; Kennel, 1921: 558, t. 21 fig. 27 (♂); Hannemann, 1961: 132, fig. 260 (♂-Genitalien), t. 13 fig. 20 (Falter). — Belgien; Frankreich; Mitteleuropa; Ungarn; Polen; Spanien.

E. (E.) agnatana (Chr.) comb. nova
agnatana Christoph, 1872, Horae Soc. Ent. Ross. 9: 15, t. fig. 12 (*Grapholitha*). — Staudinger & Rebel, 1901: 116, No. 2083; Kennel, 1916: 559, t. 21 fig. 29, 30 (♂). — Ostrußland; Südukraine; Kleinasien.

E. (E.) albidulana (H.S.)*
albidulana Herrich-Schäffer, 1851, Syst. Bearb. Schm. Eur. 4: 245 (*Semasia*) [1848, Tortr.: t. 44 fig. 310; non bin.]; *albidulata* (laps.): Drenowsky, 1925, Zschr. wiss. Ins.biol. 20: 4 (*Epiblema*). — Staudinger & Rebel, 1901: 116, No. 2082; Kennel, 1921: 559, t. 21 fig. 28 (♀); Toll, 1939: 247, t. 2 fig. 10 (♂-Genitalien); Hannemann, 1961: 125, fig. 241 (♂-Genitalien), t. 13 fig. 25 (Falter). — Deutschland; Österreich; Ungarn; Balkanhalbinsel; Süd- und Westfrankreich; Polen; Iran; Algerien; ?Ostchina.

E. (E.) rigidana (Snell.)* (4)
rigidana Snellen, 1883, Tijdschr. v. Ent. 26: 203, t. 12 fig. 4, 4a (Falter, Kopf) (*Grapholitha, Semasia*). — Staudinger & Rebel, 1901: 116, No. 2089; Kennel, 1916: 527, t. 20 fig. 29 (♀); Issiki, 1957: 59, t. 9 fig. 263 (♀); diese Arbeit: Taf. 1 Fig. 5 (♂-Genitalien). — Südostsibirien; Korea; Japan.

E. (E.) culmana (M.R.) comb. nova
culmana Müller-Rutz, 1932, Mitt. Schweiz. Ent. Ges. 15: 198, Tekstabb. (♂ ♀) (*Epiblema*). — Schweiz.

E. (E.) coagulana (Kenn.)*
coagulana Kennel, 1901, Iris 13 (1900): 278 (*Epiblema*). — Staudinger & Rebel, 1901: 263, No. 2085*bis*; Kennel, 1921: 560, t. 21 fig. 31, 32 (♂ ♀); Razowski, 1963: 256, fig. 4 (♂-Genitalien). — Transkaukasien; Taurus; Iran; Zentralasien.

E. (E.) monstratana (Rbl.)* (5)
monstratana Rebel, 1906, Iris 19: 235 (*Epiblema*). — Thomann, 1926: 164, t. 2 fig. 3 (Falter); Hannemann, 1961: 126 nota, 220 fig. (♂-Genitalien), t. 22 fig. 1 (Falter); diese Arbeit: Taf. 2 Fig. 2, Taf. 3 Fig. 5, 6, Taf. 4 Fig. 1 (Falter; ♂ ♀-Genitalien). — Schweiz; Vorarlberg; Südkarpaten.

E. (E.) scutiformis Meyr.*
scutiformis Meyrick, 1931, Bull. Sect. Sci. Acad. Roum. 14: 64 (*Eucosma*). — Clarke, 1958: 387, t. 192 fig. 3, 3a (Falter; ♂-Genitalien); diese Arbeit: Taf. 3 Fig. 2—4 (♀-Genitalien). — Ostchina.

E. (E.) kemnerana (Lewin) comb. nova
kemnerana Lewin, 1942, Opusc. Ent. 7: 70, fig. 3 (♂-Genitalien) (*Epiblema*). — Schweden.

E. (E.) cana (Hw.)*
cana Haworth, 1811, Lep. Brit.: 456 (*Tortrix*); *monetulana* Hübner, [1814—1817, Samml. eur. Schm., Tortr.: t. 41 fig. 257; non bin.]; 1822, Syst.-alph. Verz.: 62 (*Olethreutes*); *hohenwartiana* (non Schiff.): Treitschke, 1830, Schm. Eur. 8: 204 (*Grapholitha*); *carduana* Guenée, 1845, Ann. Soc. Ent. France (2) 3: 188 (*Catoptria*); *marmorana* [?Fabricius, 1798, Suppl. Ent. Syst.: 477 (*Pyralis*)]: Werneburg, 1864, Beitr. Schm.kund. 1: 561 (*Tortrix*); *scopoliana* (part.): Stephens, 1852, List Spec. Brit. Anim. 10: 62 (*Grapholita*); *hohenwarthana* var. a.: Stephens, 1852, op. cit.: 62 (*Grapholita*); *aspidiscana* var. ?b: Stephens, 1852, op. cit.: 93 (*Grapholita, Cydia*). — Staudinger & Rebel, 1901: 116, No. 2086; Kennel, 1921: 562, t. 21 fig. 36 (♀);

Pierce & Metcalfe, 1922: 72, t. 24 (♂ ♀-Genitalien); Benander, 1950: 128, fig. 11*p* (♂-Genitalien), t. 7 fig. 36 (Vorderflügel); Issiki, 1957: 59, t. 9 fig. 264 (Falter); Swatschek, 1958: 137, fig. 147, 149, 150 (Larvalmorphologie); Okano, 1959: 260, t. 174 fig. 24 (Falter); Hannemann, 1961: fig. 239*a* (♂-Genitalien; als *hohenwartiana*); Schantz, 1962: 2, fig. 1, 7 (♀ ♂-Genitalien). — Großbritannien; Europa; Armenien; Kleinasien; Zentralasien; China; Japan; Nordwestafrika.

f. (?) *subvittana* Stgr.
subvittana Staudinger, 1922, Iris 5: 299 (*Grapholita*). — Staudinger & Rebel, 1901: 116, No. 2086*a*; Kennel, 1921: 563. — Spanien; Sardinien; Nordwestafrika.

E. (E) albicosta Falk.*
albicosta Falkovitsh, 1964, Trudy Zool. Inst. Akad. Nauk SSSR 34: 279, fig. 14, 15 (♂ ♀-Genitalien) (*Eucosma*). — Transili-Alatau; Alai-Gebirge.

E. (E.) fulvana (Stph.)*
fulvana Stephens, [1829, Syst. Cat. Brit. Ins. 2: 180; nom. nud.], 1834, Illustr. Brit. Ent., Haust. 4: 123 (*Carpocapsa, Epiblema*); *pupillana* (non Cl:): Haworth, 1811, Lep. Brit.: 455 (*Tortrix*); ?*hohenwartiana* (non Schiff.): Haworth, 1811, op. cit.: 455 (*Tortrix*); ?*strigana* Curtis, 1831, Brit. Ent.: expl. t. 352 (*Carpocapsa*); *hohenwarthiana*: Stephens, 1852, List Spec. Brit. Anim. 10: 62 (*Grapholita*); *jaceana* (part.): Wocke, 1871, Stgr.-Wck. Cat. Lep. eur. Faun.: 252, No. 1046*a* (*Grapholitha, Paedisca*); *fulvanum*: Meyer, 1909, Kranchers Ent. Jahrb. 18: 147 (*Epiblema*); *scopoliana* (non Hw.): Benander, 1950, Svensk Ins.fauna 10: 128, fig. 11*q* (♂-Genitalien) (*Epiblema*). — Staudinger & Rebel, 1901: 116, No. 2084; Kennel, 1921: 563, t. 21 fig. 35 (♂); Pierce & Metcalfe, 1922: 72, t. 24 (♂ ♀-Genitalien); Swatschek, 1958: 137 (Larvalmorphologie); Hannemann, 1961: fig. 240 (♂-Genitalien; als *jaceana*); Schantz, 1962: 3, fig. 2, 10 (♂ ♀-Genitalien); Kouznetzov, 1962, Bull. Soc. ent. Mulhouse: 55, fig. 5 (♀-Genitalien). — Großbritannien; ganz Europa; Südwest- und Zentralasien; Nordchina.

E. (E.) jaceana (H.S.)*
jaceana Herrich-Schäffer, 1851, Syst. Bearb. Schm. Eur. 4: 248 (*Semasia*); *fulvana* (part.): Barrett, 1873, Ent. Mo. Mag. 10: 5. — Staudinger & Rebel, 1901: 116, No. 2084 (part.; als *fulvana*); Toll, 1939: 247, 259, t. 2 fig. 11 (♂-Genitalien). Mitteldeutschland; Sardinien; Südpolen; Ostbaltikum.

E. (E.) aurantiradix Kouzn.*
aurantiradix Kouznetzov, 1962, Bull. Soc. Ent. Mulhouse: 55, fig. 4 (♂ ♀-Genitalien) (*Eucosma, Catoptria*). — Südostsibirien (Provinz Amur).

E. (E.) haberhaueri (Kenn.) comb. nova
haberhaueri Kennel, 1901, Iris 13 (1900): 280 (*Epiblema*). — Staudinger & Rebel, 1901: 263, No. 2085*ter*; Kennel, 1921: 564, t. 21 fig. 37 (♂). — Transili-Alatau; Alai-Gebirge; Kuldscha; Ferghana.

E. (E.) hohenwartiana (Schiff.)*
hohenwartiana Schiffermiller & Denis, 1776, Syst. Verz. Schm. Wien. Geg.: 129 (*Phalaena Tortrix*); *scopoliana* (non Schiff.): Haworth, 1811, Lep. Brit.: 456 (*Tortrix); pupillana* (non Cl.): Hübner, [1796—1799, Samml. eur. Schm., Tortr. t. 4 fig. 20; non bin.], 1822, Syst.-alph. Verz.: 63 (*Olethreutes*); *hohenwarthiana*: Treitschke, 1829, Schm. Eur. 7: 232 (*Grapholita*); ?*strigana*: Westwood & Humphreys, 1845, Brit. Moth 2: 138 (*Carpocapsa*); ?*cervana*: Scopoli, 1763, Ent. Carn.: 234 (*Phalaena*); Zeller, 1855, Stett. Ent. Ztg. 16: 246 (*Tortrix*); ?*hybridella* (part.): Lederer, 1859, Wien. Ent. Mschr. 3: 278 (*Coccyx*); *hohenworthiana* (lapsus): Blackmore, 1864, Ent. Mo. Mag. 1: 123; *jaceana* (part.): Wocke, 1871, Stgr.-Wck., Cat. Lep. eur. Fauna: 252, No. 1046a (*Grapholitha, Paedisca*); *carduana* (part.): Wocke, 1871, op. cit.: 252, No. 1047 (*Grapholitha, Paedisca*); *scopolianum*: Meyer, 1909, Kranchers Ent. Jahrb. 18: 147 (*Epiblema*); *scopaliana* (lapsus): Clutten, 1930, The Ent. 63: 114 (*Catoptria*); *fulvana* (non Stph.): Benander, 1950, Svensk Ins.fauna 10: 128, fig. 11*r* (♂-Genitalien) (*Epiblema*);

hoenwartiana (err. typogr.): Bradley, 1959, Ent. Gaz. 10: t. 7 fig. 80 (Falter) (*Eucosma*); *cana* (non Hw.): Hannemann, 1961, Dahls Tierwelt Dtschl. 48, Kleinschm. 1: fig. 245 (♂-Genitalien) (*Eucosma*). — Staudinger & Rebel, 1901: 116, No. 2085 (als *scopoliana*); Kennel, 1921: 561, t. 21 fig. 33 (♂; als *scopoliana*); Pierce & Metcalfe, 1922: 72, t. 24 (♂ ♀-Genitalien; als *scopolina*); Swatschek, 1958: 136 (Larvalmorphologie); Schantz, 1962: 4, fig. 3, 8 (♂ ♀-Genitalien). — Großbritannien; Europa; Ciskaukasien; Nordwestafrika.

f. *parvulana* Stt.
parvulana Stainton, 1858, Man. Brit. Butt. & Moths 2: 210 (*Catoptria*). — Staudinger & Rebel, 1901: 116, No. 2085a; Kennel, 1921: 561, t. 21 fig. 34 (♂); Pierce & Metcalfe, 1922: 72, t. 24 (♂-Genitalien).

E. (E.) **balatonana** (Osth.) comb. nova* (6)
balatonana Osthelder, 1937, Iris 51: 109 (*Epiblema*); *fulvana* (non Stph.) Hannemann, 1961, Dahls Tierwelt Dtschl. 48, Kleinschm. 1: fig. 242 (♂-Genitalien) (*Eucosma*); synon. nov.: *danicana* Schantz, 1962, Notulae Ent. 42: 5, fig. 4, 11 (♂ ♀-Genitalien) (*Eucosma*). — Diese Arbeit: Taf. 4 Fig. 2—3 (Falter, ♂-Genitalien). — Dänemark; Deutschland; Österreich; Ungarn.

E. (E.) **afflicta** Falk.*
afflicta Falkovitsh, 1964, Trudy Zool. Inst. Akad. Nauk SSSR 34: 277, fig. 12, 13 (♂ ♀-Genitalien) (*Eucosma*). — Sibirien (Provinzen Kemerovo und Krasnojarsk; Dschungar- und Transili-Alatau.

E. (E.) **expallidana** (Hw.)* (7)
expallidana Haworth, 1811, Lep. Brit.: 469 (*Tortrix*); *rufana* Stephens, [1829, Syst. Cat. Brit. Ins. 2: 180, No. 6983 (*Semasia*); nom. nud.], 1834, Illustr. Brit. Ent., Haust. 4: 124 (*Carpocapsa, Epiblema*); *obumbratana* Zeller, 1846, Isis: 240 (*Grapholitha*); *westwoodiana* Doubleday, 1850, Synon. List Brit. Lep.: 26 (*Catoptria*); *ibiceana* Herrich-Schäffer, 1851, Syst. Bearb. Schm. Eur. 4: 249 (*Semasia*); *lanceolana* (part.): Lederer, 1859, Wien. Ent. Mschr. 3: 345 (*Grapholitha*). — Staudinger & Rebel, 1901: 116, No. 2088; Kennel, 1921: 566, t. 21 fig. 41 (♀); Pierce & Metcalfe, 1922: 72, t. 25 (♂ ♀-Genitalien); Benander, 1942: 44, fig. 1*e, g* (♂ ♀-Genitalien); Swatschek, 1958: 138, fig. 153, 154 (Larvalmorphologie); Hannemann, 1961: 126, fig. 244 (♂-Genitalien), t. 15 fig. 2 (Falter); Schantz, 1962: 6, fig. 5, 9 (♂ ♀-Genitalien). — Großbritannien; Nord- und Mitteleuropa; Norditalien; Spanien; Balkan; Polen; Ostbaltikum; Nordwest- und Ostrußland; Ukraine; Zentralasien (Alai-Gebirge); Südostsibirien.

E. (E.) **sublucidana** (Kenn.) comb. nova
sublucidana Kennel, 1901, Iris 13 (1900): 282 (*Epiblema*). — Staudinger & Rebel, 1901: 263, No. 2089*bis*; Kennel, 1921: 566, t. 21 fig. 42 (♂). — Aragonien.

E. (E.) **scutana** (Const.)*
scutana Constant, 1893, Ann. Soc. Ent. France 62: 391, t. 11 fig. 3 (*Grapholitha*). — Staudinger & Rebel, 1901: 116, No. 2087; Kennel, 1921: 565, t. 21 fig. 39, 40 (♂ ♀); Swatschek, 1958: 137, fig. 151, 152 (Larvalmorphologie); Hannemann, 1961: 126, fig. 243 (♂-Genitalien), t. 15 fig. 3 (Falter); Razowski, 1961: 676, t. 88 fig. 12 (♂-Genitalien). — Südwest- und Süddeutschland; Schweiz; Südfrankreich; Mittelitalien; Sizilien.

E. (E.) **flavispecula** Kuzn.* (8)
flavispecula Kuznetzov, 1964, Trudy Zool. Inst. Akad. Nauk SSSR 34: 260, fig. 3*a*, 4*a* (♂ ♀-Genitalien) (*Eucosma*). — Diese Arbeit: Taf. 5 Fig. 3, 5 (Falter). — Burgenland; Südtirol; Rumänien; Südukraine; Zentral- und Ostrußland; Sibirien.

E. (E.) **scorzonerana** (Ben.)*
scorzonerana Benander, 1942, Opusc. Ent. 7: 46, fig. 1*f, h* (♂ ♀-Genitalien) (*Epiblema*). — Benander, 1950: 129, fig. 11*t* (♂-Genitalien); Schantz, 1962: 8, fig. 6 (♂-Genitalien); Kuznetzov, 1964 fig. 3*b*, 4*b* (♂ ♀-Genitalien). — Schweden; Finnland; Nordwestrußland; Ostbaltikum; Polen.

E. (E.) individiosana (Kenn.) comb. nova* (9)
individiosana Kennel, 1901, Iris 13 (1900): 278 (*Epiblema*). — Staudinger & Rebel, 1901: 263, No. 2088*quat.*; Kennel, 1921: 556, t. 21 fig. 23 (♂). — Algerien.

E. (E.) cumulana (Gn.)*
cumulana Guenée, 1845, Ann. Soc. Ent. France (2) 3: 189 (*Catoptria*); *hornigiana* Hornig, 1857, Wien. Ent. Mschr. 1: 72 (*Grapholitha*). — Staudinger & Rebel, 1901: 116, No. 2091; Kennel, 1921: 568, t. 21 fig. 46 (♀); Hannemann, 1961: 125 nota, 220 fig. (♂-Genitalien), t. 11 fig. 6 (Falter). — Österreich; Ungarn; Rumänien; Mazedonien; ?Nordwestrußland.

ssp. *caradjai* nom. nov.
obscurana Caradja, 1916, Iris 30: 66 (*Epiblema*; praeoc. per F., 1798); *cumulana* (part.): Rebel, 1901, Stgr.-Rbl. Cat. Lep. Pal. Faun. 2: 116, No. 2091 (*Epiblema*). — Kennel, 1921: 568, t. 21 fig. 47 (♂). — Südfrankreich; Spanien.

E. (E.) umbratana (Stgr.) comb. nova*
umbratana Staudinger, 1879, Horae Soc. Ent. Ross. 15: 253 (*Grapholitha*). — Staudinger & Rebel, 1901: 117, No. 2094; Kennel, 1921: 570, t. 21 fig. 50 (♂); diese Arbeit: Taf. 5 Fig. 1 (♂-Genitalien). — Mittelitalien; Sizilien; Albanien; Mazedonien; Kleinasien; Armenien.

E. (E.) fervidana (Z.)*
fervidana Zeller, 1847, Isis: 730 (*Paedisca*). — Staudinger & Rebel, 1901: 116, No. 2092; Kennel, 1921: 568, t. 21 fig. 48 (♀); Hannemann, 1961: 128, fig. 249 (♂-Genitalien), t. 12 fig. 3 (Falter); diese Arbeit: Taf. 5 Fig. 2 (♂-Genitalien). — Niederösterreich; Kärnten; Dalmatien; ?Südkarpaten; Sizilien; Sardinien; Süditalien; Algerien.

E. (E.) decolorana (Frr.)*
decolorana Freyer, 1842, Neue Beitr. Schm.kunde 4: 48, t. 318 fig. 5 (*Paedisca*); *?hinnebergiana* (non Fuchs): Krone, 1911, Jahresber. Wien. Ent. Ver. 21 (1910): 42 (*Semasia*). — Staudinger & Rebel, 1901: 116, No. 2090; Kennel, 1921: 567, t. 21 fig. 45 (♂); Obraztsov, 1946: 38, fig. 2 (♂-Genitalien); Hannemann, 1961: 128, fig. 250 (♂-Genitalien) t. 11 fig. 6 (Falter). — Frankreich; Osten von Mitteldeutschland; Rhein; Österreich; Ungarn; Polen; Ukraine; Ost- und ?Nordwestrußland; ?Westchina (Bathang); ?Westpakistan (Karachi).

E. (E.) kurdistana (Ams.) comb. nova
kurdistana Amsel, 1959, Bull. Soc. Ent. Egypte 43: 58, t. 5 fig. 1 (♂-Genitalien) (*Epiblema*). — Irak.

E. (E.) victoriana (Kenn.) comb. nova* (10)
victoriana Kennel, 1919, Mitt. Münchn. Ent. Ges. 8: 86, t. 3 fig. 18, 19 (*Epiblema*). — Diese Arbeit: Taf. 6 Fig. 1—3 (Falter, ♂-Genitalien). — Sibirien (Sajan).

E. (E.) recentana (Zerny) comb. nova*
fessana (non Mn.): Kennel, 1921, Pal. Tortr.: 548, t. 21 fig. 3 (♂) (*Epiblema*); *recentana* Zerny, 1933, Iris 47: t. 1 fig. 9; 1934, ibid. 48: 16 (*Epiblema*). — Diese Arbeit: Taf. 6 Fig. 4 (Falter). — Nordlibanon; Mesopotamien.

E. (E.) guentheri (Tgstr.) comb. nova*
güntheri Tengström, 1869, Acta Soc. Faun. Flora Fenn. 10: 361 (71) (*Grapholitha*). — Staudinger & Rebel, 1901: 118, No. 2124; Kennel, 1921: 620, t. 23 fig. 21 (♂); Toll, 1958: 74, fig. 10 (♂-Genitalien), t. 3 fig. 13 (Falter); diese Arbeit: Taf. 5 Fig. 4 (♂-Genitalien). — Finnland; Ostkarelien.

Species incertae sedis

E. (E.) atelosticta Meyr.
atelosticta Meyrick, 1922, Exot. Micr. 2: 516 (*Eucosma*). — Viette, 1952: 150 (Typus); Razowski, 1960a: 385, fig. 19 (♀-Genitalien). — Ostchina (Schanghai).

E. (E.) catharaspis (Meyr.)
catharaspis Meyrick, 1922, Exot. Micr. 2: 514 (*Ancylis*); *cataraspis* Razowski, 1960, Polsk. Pismo Ent. 30: 386, fig. 20 (♀-Genitalien) (*Eucosma*). — Viette, 1952: 150 (Typus). — Ostchina (Schanghai).

E. (E.) coeruleostriana Car.
coeruleostriana Caradja, 1939, Iris 53: 11 (*Eucosma*). — Nordchina (Schansi).

E. (E.) disjectana (Kenn.) comb. nova
disjectana Kennel, 1921, Pal. Tortr.: 558, t. 21 fig. 26 (*Epiblema*); *disjectama* (err. typogr.): Petersen, 1924, Lep.-Fauna Estl.: 459 (*Epiblema*). — ?Livland.

E. (E.) erebantra Meyr.
erebantra Meyrick, 1937, Iris 51: 181 (*Eucosma*). — Yünnan.

E. (E.) ignotana (Car.) comb. nova
ignotana Caradja, 1916, Iris 30: 64 (*Semasia*). — Südostsibirien (Kasakewitsch).

Sg. Pygolopha Ld., 1859

E. (P.) lugubrana (Tr.)*
lugubrana Treitschke, 1830, Schm. Eur. 8: 26 (*Penthina*); *tinacriana* Lederer, 1859, Wien. Ent Mschr. 3: 280, t. 2 fig. 1, 2 (*Pygolopha*); *amandana* (ex err.): Aigner-Abafi, 1898, Illustr. Zschr. Ent. 3: 312 (*Phtheochroa*); *trinacriana* (laps.): Rebel, 1901, Stgr.-Rbl., Cat. Lep. Pal. Faun. 2: 115 (*Pygolopha*). — Staudinger & Rebel, 1901: 115, No. 2066; Kennel, 1908: 53, t. 2 fig. 5—8 (Geäder, ♀-Hinterleibspitze); 1921: 545, t. 20 fig. 62, 63 (♂ ♀); Hannemann, 1961: 129, fig. 251-251*b* (Kopf, Geäder, ♂-Genitalien). — Ungarn; Niederösterreich; Karawanken; Tschechoslowakei; Südtirol; Istrien; Mazedonien; Sizilien; Südfrankreich.

f. *tarica* Hartig
tarica Hartig, 1949, Bol. Assoc. Rom. Ent. 4: 2, t. 1 fig. 1 (*Pygolopha*). — Garda-See.

Sg. Palpocrinia Kenn., 1919

E. (P.) ottoniana (Kenn.) comb. nova*
ottoniana Kennel, 1919, Mitt. Münchn. Ent. Ges. 8: 66, t. 2 fig. 20 (Falter), t. 4 fig. 5 (Kopf) (*Palpocrinia*). — Obraztsov, 1955: 163, fig. 279 (Kopf); 1956: 117; 1965: 25; diese Arbeit: Taf. 7 Fig. 1 (♂-Genitalien). — Lob-Noor.

Sg. Phaneta Stph., 1852

E. (P.) niveicaput (Wlsm.) comb. nova*
niveicaput Walsingham, 1900, Ann. Mag. N.H. (7) 6: 406 (*Thiodia*). — Issiki, 1957: 63, t. 10 fig. 296 (Falter); diese Arbeit: Taf. 6 Fig. 5, Taf. 7 Fig. 2—3 (♂ ♀-Genitalien). — Japan.

E. (P.) brachysticta Meyr.*
brachysticta Meyrick, 1935, *in* Caradja & Meyrick, Mater. Microlep. Fauna chines. Prov.: 55 (*Eucosma*). — Diese Arbeit: Taf. 7 Fig. 4—5 (Falter, ♂-Genitalien). — Ostchina.

E. (P.) nitorana Kuzn.*
nitorana Kuznetzov, 1962, Bull. Soc. Ent. Mulhouse: 57, fig. 6 (♂ ♀-Genitalien) (*Eucosma, Phaneta*). — Südostsibirien.

E. (P.) pergratana (Rbl.) comb. nova*
pergratana Rebel, 1914, Iris 28: 274, t. 4 fig. 11 (*Steganoptycha*). — Kuldscha.

E. (P.) messingiana (F.R.)*
messingiana Fischer v. Röslerstamm, 1837, Abb. Bericht. Ergänz. Schm.kunde: 89, t. 40 fig. 1*a-b* (*Grapholitha*); *wimmeriana* (part.): Lederer, 1859, Wien. Ent. Mschr. 3: 337 (*Grapholitha*). — Staudinger & Rebel, 1901: 114, No. 2034; Kennel, 1916: 524, t. 20 fig. 21 (♂); Benander, 1950: 120, fig. 11*f* (♂-Genitalien), t. 7 fig. 34 (Vorderflügel); Hannemann, 1961: 133, fig. 264 (♂-Genitalien), t. 15 fig. 20 (Falter). — Nord- und Mitteleuropa; Ostbaltikum; Ungarn; Südpolen; Ukraine; Ostrußland; Südostsibirien; ?Spanien.

E. (P.) ursulana (Kenn.) comb. nova
ursulana Kennel, 1919, Mitt. Münchn. Ent. Ges. 8: 85, t. 3 fig. 17 (*Semasia*). — Ostrußland (Uralsk); Zentralsibirien (Ostsajan).

E. (P.) nessebarana (Soffner) comb. nova*
nessebarana Soffner, 1962, Dtsche Ent. Zschr. (N.F.) 9: 140, fig. 5 (♂ ♀-Genitalien) (*Semasia*). — Ostbulgarien.

E. (P.) sparsana (Rbl.) comb. nova*
sparsana Rebel, 1935, Bull. Soc. Lépid. Génève 7: 175 (*Semasia*). — Diese Arbeit: Taf. 7 Fig. 6 (Falter). — Kleinasien.

E. (P.) pylonitis Meyr.*
pylonitis Meyrick, 1932, Exot. Micr. 4: 307 (*Eucosma*). — Clarke, 1958: 384, t. 191 fig. 3—3*a* (Falter, ♂-Genitalien). — Kaschmir.

E. (P.) pauperana (Dup.)*
pauperana Duponchel, 1843, Hist. Nat. Lépid. France, Suppl. 4: 170, t. 64 fig. 10 (*Cochylis*); *?paykulliana* (non F.): Haworth, 1811, Lep. Brit.: 435 (*Tortrix*). — Staudinger & Rebel, 1901: 110, No. 1971; Kennel, 1916: 493, t. 19 fig. 40 (♂); Pierce & Metcalfe, 1922: 70, t. 24 (♂ ♀-Genitalien). — England; Mittel- und Südeuropa; Polen; Kleinasien.

E. (P.) muliebris Meyr.
muliebris Meyrick, 1922, Exot. Micr. 2: 515 (*Eucosma*). — Razowski, 1960*a*: 385, fig. 11 (♂-Genitalien). — Korea.

E. (P.) tundrana (Kenn.)*
tundrana Kennel, 1900, Iris 13: 148, t. fig. 24, 25 (*Semasia*); *cordulana* (Kennel, i.l.) Rebel, 1917, Iris 30: 192 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 2044*bis*; Kennel, 1916: 523, t. 20 fig. 20 (♀); Osthelder, 1939: 90, t. 2 fig. 49 (♀); Toll, 1939: 245, 259, t. 2 fig. 8 (♂-Genitalien); Hannemann, 1961: 133, fig. 266 (♂-Genitalien), t. 5 fig. 13, t. 21 fig. 7 (Falter). — Zentralasien; Sibirien; Mandschurei; Ostrußland; Ukraine; Südostpolen; Ungarn; Südbayern.

E. (P.) brigittana (Kenn.) comb. nova
brigittana Kennel, 1919, Mitt. Münchn. Ent. Ges. 8: 83, t. 3 fig. 15 (*Semasia*). — Ost-Tannuola.

E. (P.) sybillana (Kenn.) comb. nova
sybillana Kennel, 1919, Mitt. Münchn. Ent. Ges. 8: 82, t. 3 fig. 14 (*Semasia*). — Sibirien (Sajan).

E. (P.) amellana (Preiss.)*
amellana Preissecker, 1930, Verh. zool.-bot. Ges. Wien 80: (20), fig. 3 rechts (*Semasia*). — Hannemann, 1961: 130 nota, 220 fig. (♂-Genitalien), t. 21 fig. 21 (Falter); diese Arbeit: Taf. 6 Fig. 6, Taf. 8 Fig. 2, Taf. 9 Fig. 1 (Falter, ♂ ♀-Genitalien). — Österreich.

E. (P.) krygeri (Rbl.)*
krygeri Rebel, 1937, Zschr. Österr. Ent. Ver. 22: 42, t. 2 fig. 3 (*Semasia*). — Worm-Hansen & Larsson, 1947: 174—195, 187 fig. 1—10 (Falter, Kopf, Beine, Puppe, Beschädigung), 188

fig. 1—20 (Larvalmorphologie), 190 fig. 1, 3, 4 (♂ ♀-Genitalien); Hannemann, 1961: 129 nota, 220 fig. (♂-Genitalien), t. 21 fig. 22 (Falter); diese Arbeit: Taf. 8 Fig. 4, 6, Taf. 9 Fig. 2 (Falter, ♂ ♀-Genitalien). — Dänemark.

E (P.) tarandana (Möschl.)*
tarandana Möschler, 1874, Stett. Ent. Ztg. 35: 165 (*Grapholitha*); *taradana* (err. typogr.): Heinrich, 1923, Bull. U.S. Natl. Mus. 123: 296 (*Thiodia*). — Staudinger & Rebel, 1901: 114, No. 2048; Kennel, 1916: 517, t. 20 fig. 7 (♂); Heinrich, 1923: 52, t. 16 fig. 112 (♂-Genitalien). — Labrador; Kanada; ?Dahurien.

E. (P.) sinensis (Wlsm.) comb. nova*
sinensis Walsingham, 1900, Ann. & Mag. N.H. (7) 6: 406 (*Thiodia*). — Diese Arbeit: Taf. 8 Fig. 3, 5 (Falter, ♂-Genitalien). — Ostchina.

E. (P.) urbana (Kenn.) comb. nova
urbana Kennel, 1901, Iris 13 (1900): 271 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 2022*bis*; Kennel, 1916: 526, t. 20 fig. 26 (♂). — Spanien; Kleinasien.

E. (P.) glebana (Snell.) comb. nova*
glebana Snellen, 1883, Tijdschr. v. Ent. 26: 206, t. 12 fig. 6, 6*a* (Falter, Kopf) (*Grapholitha, Semasia*). — Staudinger & Rebel, 1901: 114, No. 2024; Kennel, 1916: 527, t. 20 fig. 27, 28 (♂ ♀); Issiki, 1957: 58, t. 9 fig. 262 (Falter); diese Arbeit: Taf. 8 Fig. 7 (♂-Genitalien). — Südostsibirien; Japan.

E. (P.) gracilis (Fil.) comb. nova
gracilis Filipjev, 1925, Jahrb. Martianov. Staatsmus. 2 (3): 61 (*Semasia*). — Sibirien (Minussinsk).

E. (P.) cetratana (Kenn.) comb. nova
cetratana Kennel, 1901, Iris 13 (1900): 264 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 2032*bis*; Kennel, 1916: 510, t. 19 fig. 76 (♂). — Originalfundort und Verbreitung unbekannt.

E. (P.) fraudulentana (Kenn.) comb. nova
fraudulentana Kennel, 1901, Iris 13 (1900): 265 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 2045*bis*; Kennel, 1916: 510, t. 19 fig. 77 (♀). — Alatau-Gebirge.

E. (P.) intermediana (Kenn.) comb. nova
intermediana Kennel, 1900, Iris 13: 146, t. f. 21 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 2045*ter*; Kennel, 1916: 511, t. 19 fig. 78 (♂). — Amur.

E. (P.) malitiosana (Kenn.) comb. nova
malitiosana Kennel, 1901, Iris 13 (1900): 266 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 2054*bis*; Kennel, 1916: 511, t. 19 fig. 79 (♂). — Mongolei (Uliassutai).

E. (P.) lignana (Snell.) comb. nova
lignana Snellen, 1883, Tijdschr. v. Ent. 26: 235, t. 12 fig. 5, 5a (Falter, Kopf) (*Grapholitha, Semasia*); *messingiana* (part.): Rebel, 1901, Stgr.-Rbl. Cat. Lep. Pal. Faun. 2: 114, No. 2034 (*Semasia*); *elongata* Filipjev, 1924, Jahrb. Martianov. Staatsmus. 2 (3): 24, 38 (*Semasia*). — Filipjev, 1930a: 6, t. 2 fig. 7 (Falter). — Sibirien (Irkutsk, Tschita).

E. (P.) metana (Kenn.) comb. nova
metana Kennel, 1919, Mitt. Münchn. Ent. Ges. 8: 84, t. 3 fig. 16 (*Semasia*). — Ostchina (Schanghai).

E. (P.) striatiradix Kuzn.*
striatiradix Kuznetzov, 1964, Trudy Zool. Inst. Akad. Nauk SSSR 34: 262, fig. 5 (♂ ♀-Genitalien) (*Eucosma, Phaneta*). — Südostsibirien; Minussinsk.

E. (P.) tripoliana (Barr.)*
tripoliana Barrett, 1880, Ent. Mo. Mag. 17: 84 (*Catoptria*); *aemulana* (non Schl.): Pierce & Metcalfe, 1922, Genit. Brit. Tortr.: 71, t. 24 (♂ ♀-Genitalien) (*Phaneta*). — Staudinger & Rebel, 1901: 114, No. 2032; Kennel, 1916: 519, t. 20 fig. 11 (♀); Wolff, 1952: 61 (Systematik); Swatschek, 1958: 140 (Larvalmorphologie; als *aemulana*); Hannemann, 1961: 132, fig. 259 (♂-Genitalien), t. 20 fig. 11 (♂). — England; Holland; Deutschland; Frankreich; ?Polen.

E. (P.) aspidiscana (Hb.)*
?cervana Scopoli, 1763, Ent. Carn.: 234 (*Phalaena*); *?obscurana* Fabricius, 1798, Suppl. Ent. Syst.: 476 (*Pyralis*); *?petiverella* (non L.): Charpentier, 1821, Zinsler etc.: 120 (*Tinea*); *aspidiscana* Hübner, [1814—1817, Samml. eur. Schm., Tortr.: t. 41 fig. 256; non bin.], 1822, Syst.-alph. Verz.: 58 (*Olethreutes*); *?zachana* Hübner, [1814—1817, op. cit.: t. 38 fig. 243; non bin.], 1822, op. cit.: 66 (*Olethreutes*); *aspidana* Frölich, 1828, Enum. Tortr. Würt.: 96 (*Tortrix*); *dahlbomiana* Zetterstedt, 1840, Ins. Lap.: 987 (*Phoxopteris*); *nebritana* (ex err.): Herrich-Schäffer, 1848, Syst. Bearb. Schm. Eur. 4: t. 33 fig. 241 (non bin.). — Staudinger & Rebel, 1901: 114, No. 2049; Kennel, 1916: 517, t. 20 fig. 8 (♀); Pierce & Metcalfe, 1922: 71, t. 24 (♂ ♀-Genitalien); Higgins, 1934: 169, fig. 1 (Labialpalpus), t. 2 fig. 3, 4 (♂ ♀); Benander, 1928: 147, fig. 4*m-o* (Larvalmorphologie); 1950: 119, fig. 11*j* (♂-Genitalien), t. 7 fig. 30 (Vorderflügel); Swatschek, 1958: 139, fig. 156 (Larvalmorphologie); Hannemann, 1961: 130, fig. 257 (♂-Genitalien), t. 13 fig. 26 (Falter). — Großbritannien; ganz Europa und Sibirien; Zentralasien; Armenien; Kleinasien; Nordwestafrika.

f. *rubescana* Const.
rubescana Constant, 1895, Bull. Soc. Ent. France: LI (*Grapholitha*). — Staudinger & Rebel, 1901: 114, No. 2049*a*; Kennel, 1916: 517, t. 20 fig. 9 (♀).

E. (P.) saussureana (Ben.) comb. nova*
saussureana Benander, 1928, Ent. Tidskr. 29: 142, fig. 4*a-l* (♂-Genitalien, Larval- und Pupalmorphologie) (*Phaneta, Semasia*). — Benander, 1950: 119, fig. 11*h* (♂-Genitalien), t. 7 fig. 31 (Vorderflügel). — Schweden; Finnland.

E. (P.) gradensis (Galv.) comb. nova*
gradensis Galvagni, 1909, Mitt. Naturwiss. Ver. Wien. Univ. 7: 248 (*Semasia*). — Diese Arbeit: Taf. 8 Fig. 1, 8 (Falter, ♂-Genitalien). — Dalmatien (Grado).

E. (P.) catoptrana (Rbl.) status & comb. nov.
catoptrana Rebel, 1903, Verh. zool.-bot. Ges. Wien 53: 91 (*Semasia*); *rubescana* (non Const.): Huggins, 1924, The Ent. 57: 14 (*Catoptria*); synon. nov.: *heringiana* Jäckh, 1953, Zschr. Lepid. 3: 43, fig. 1, 2 (*Catoptria, Semasia*). — Kennel, 1921: 719; Huggins, 1934: 169, fig. 1 (Labialpalpus), t. 2 fig. 1, 2 (♂ ♀) (als *rubescana*); Bradley, 1959: 62, fig. 6 (♂-Genitalien), t. 8 fig. 85 (Falter); Hannemann, 1961: 129, fig. 254 (♂-Genitalien), t. 20 fig. 22 (Falter) (bei den beiden letzteren Autoren als *heringiana*). — England; Ostfriesische Inseln (Wangeroog); Österreich; Spanien.

E. (P.) conterminana (Gn.)*
conterminana Guenée, 1845, Ann. Soc. Ent. France (2) 3: 189 (*Catoptria*); *caecimaculata* Duponchel, 1835, Hist. Nat. Lép. France 9: t. 249 fig. 5*b* (non bin.). — Herrich-Schäffer, 1848: t. 42 fig. 297; 1851: 247; Staudinger & Rebel, 1901: 114, No. 2051; Kennel, 1916: 519, t. 20 fig. 12 (♀); Pierce & Metcalfe, 1922: 71, t. 24 (♂ ♀-Genitalien); Swatschek, 1958: 140, fig. 158 (Larvalmorphologie); Hannemann, 1961: 130, fig. 258 (♂-Genitalien), t. 13 fig. 23 (Falter). — Großbritannien; ganz Europa; Ciskaukasien; Armenien; Südostsibirien; Zentralasien.

E. (P.) incinerana (Const.) comb. nova
incinerana Constant, 1888, Ann. Soc. Ent. France (6) 8: 167, t. 4 fig. 6 (*Grapholitha*). — Staudinger & Rebel, 1901: 114, No. 2050; Kennel, 1916: 520, t. 20 fig. 13 (♂). — Südfrankreich.

E. (P.) incana (Z.)*
incana Zeller, 1946, Isis: 239 (*Grapholitha*). — Staudinger & Rebel, 1901: 114, No. 2046; Kennel, 1916: 520, t. 20 fig. 14 (♂); Swatschek, 1958: 141 (Larvalmorphologie); Hannemann, 1961: 130, fig. 256 (♂-Genitalien), t. 13 fig. 24 (Falter). — Mittel- und Südeuropa; Holland; Ostbaltikum; Polen; Ukraine; Rußland.

E. (P.) aemulana (Schläg.)*
aemulana Schläger, 1849, Ber. lepid. Tauschver. Jena: 39 (*Grapholitha*); *latiorana* Herrich-Schäffer, 1851, Syst. Bearb. Schm. Eur. 4: 248 (*Semasia*) [1848, Tortr.: t. 44 fig. 312; non bin.]; *modestana* Stainton, 1859, Man. Brit. Butt. & Moths 2: 242 (*Grapholitha*); *?decolorana* (non Frr.): Barrett, 1885, Ent. Mo. Mag. 21: 109 (*Catoptria*). — Staudinger & Rebel, 1901: 114, No. 3031; Kennel, 1916: 518, t. 20 fig. 10 (♀); Pierce & Metcalfe, 1922: 71, t. 24 (♂ ♀-Genitalien; als *latiorana*); Wolff, 1952: 61, 62 (Systematik; als *latiorana*); Swatschek, 1958: 140, fig. 157 (Larvalmorphologie; als *latiorana*); Hannemann, 1961: 130, fig. 255 (♂-Genitalien), t. 13 fig. 22 (Falter). — England; Schottland; ?Dänemark; Holland; Mitteleuropa; Frankreich; ?Slowakei; ?Rumänien; Ostbaltikum; Polen; Nordwestrußland; ?Transili-Alatau.

E. (P.) intacta (Wlsm.) comb. nova *
intacta Walsingham, 1900, Ann. & Mag. N.H. (7) 6: 405 (*Thiodia*). — Issiki, 1957: 59, t. 9 fig. 265 (Falter); diese Arbeit: Taf. 9 Fig. 3, Taf. 10 Fig. 2 (Falter, ♂-Genitalien). — China; Japan.

E. (P.) cretaceana (Kenn.) comb. nova
cretaceana Kennel, 1899, Iris 12: 42, t. 1 fig. 41 (*Grapholitha*). — Staudinger & Rebel, 1901: 121, No. 2170; Kennel, 1916: 521, t. 20 fig. 15 (♂). — Spanien; Albanien.

E. (P.) metzneriana (Tr.)*
metzneriana Treitschke, 1830, Schm. Eur. 8: 277 (*Cochylis*). — Staudinger & Rebel, 1901: 114, No. 2043; Kennel, 1916: 522, t. 20 fig. 17 (♂); Issiki, 1957: 59, t. 9 fig. 266 (Falter); Swatschek, 1958: 142 (Larvalmorphologie); Okano, 1959: 260, t. 174 fig. 25 (♀); Hannemann, 1961: 133, fig. 265 (♂-Genitalien), t. 15 fig. 14 (Falter). — Mitteleuropa; Holland; Belgien; Frankreich; Ungarn; Südtirol; Dalmatien; Polen; Ukraine; Süd- und Ostrußland; Iran; Sibirien; China; Korea; Japan; ?Nordwestafrika.

f. *osthelderi* Dufr.
osthelderi Dufrane, 1955, Bull. Inst. Roy. Sci. Nat. Belg. 31 (33): 3 (*Eucosma*). — Belgien.

f. *anserana* Hein. status nov.
anserana Heinemann, 1863, Schm. Dtschl. u. Schweiz (2) 1 (1): 169 (*Grapholitha, Semasia*). — Staudinger & Rebel, 1901: 114, No. 2028; Kennel, 1916: 521, t. 20 fig. 16 (♂); Toll, 1939: 245, 259, t. 1 fig. 6, 7 (♂-Genitalien). — Ungarn; Bulgarien; Südpolen; Ukraine; Ostrußland.

f. *joannisiola* Dufr.
joannisiola Dufrane, 1955, Bull. Inst. Roy. Sci. Nat. Belg. 31 (33): 3 (*Eucosma*). — Schanghai.

E. (P.) wimmerana (Tr.)*
wimmerana Treitschke, 1835, Schm. Eur. 10 (3): 256 (*Grapholitha*); *wimmeriana* Lederer, 1859, Wien. Ent. Mschr. 3: 337 (*Grapholitha*). — Staudinger & Rebel, 1901: 114, No. 2044; Kennel, 1916: 522, t. 20 fig. 18 (♂); Hannemann, 1961: 132, fig. 262 (♂-Genitalien), t. 20 fig. 21 (Falter). — Nordfrankreich; Norditalien; Ungarn; Ukraine; Ostrußland; Armenien.

E. (P.) maritima (Westw. & Humphr.)*
maritima Westwood & Humphreys, 1845, Brit. Moths 2: 138 (*Carpocapsa*); *wimmerana* (non Tr.): Doubleday, 1849, Synon. List Brit. Lepid.: 26 (*Catoptria*); *?lacteana* (non Tr.): Stephens, 1852, List Spec. Brit. Anim. 10: 62 (*Grapholita*); *caudidulana* Nolcken, 1870, Arb. Naturf. Ver. Riga (N.F.) 3: 413 (*Grapholitha*). — Staudinger & Rebel, 1901: 116, No. 2080; Kennel,

1916: 523, t. 20 fig. 19 (♂; bei den beiden Autoren als *candidulana*); Pierce & Metcalfe, 1922: 70, t. 24 (♂ ♀-Genitalien); Worm-Hansen & Larsson, 1947: 190, fig. 2 (♂-Genitalien; als *candidulana*); Benander, 1950: 119, fig. 11*g* (♂-Genitalien), t. 7 fig. 33 (Vorderflügel); Swatschek, 1958: 142 (Larvalmorphologie); Hannemann, 1961: 133, fig. 263 (♂-Genitalien), t. 15 fig. 23 (Falter). — England; Dänemark; Holland; Belgien; Mitteleuropa; Frankreich; Südmähren; Skandinavien; Finnland; Nordwestrußland; Ostbaltikum; Polen; Ukraine.

E. (P.) apocrypha Falk.*
apocrypha Falkovitsh, 1964, Trudy Zool. Inst. Akad. Nauk SSSR 34: 280, fig. 16, 17 (♂ ♀-Genitalien) (*Eucosma, Phaneta*). — Kasachstan.

ssp. *tagarica* Falk.
tagarica Falkovitsh, 1964, Trudy Zool. Inst. Akad. Nauk SSSR 34: 282 (*Eucosma*). — Sibirien (Provinz Krasnojarsk).

E. (P.) nigromaculana (Hw.)*
nigro-maculana Haworth, 1811, Lep. Brit.: 436 (*Tortrix*); *nigromaculana*: Stephens, 1829, Syst. Cat. Brit. Ins. 2: 178, No. 6962 (*Anchylopera); nigromaculata* Wood, 1839, Ind. Ent.: 144, t. 32 fig. 962 (*Anticlea*); *freyeriana* Fischer v. Röslerstamm, 1839, Abb. Bericht. Ergänz. Schm.kunde: 132, t. 51 fig. 3 (*Grapholitha*); *nigrimaculana* Barrett, 1874, Ent. Mo. Mag. 11: 134; *campoliliana* (non Schiff.): Hannemann, 1961, Dahls Tierw. Mitteleur. 48, Microlep. 1: 132, fig. 261 (♂-Genitalien), t. 13 fig. 19 (Falter) (*Eucosma, Phaneta*). — Staudinger & Rebel, 1901: 110, No. 1972; Kennel, 1916: 496, t. 19 fig. 48 (♀); Pierce & Metcalfe, 1922: 70, t. 24 (♂ ♀-Genitalien); Swatschek, 1958: 139, fig. 155 (Larvalmorphologie). — Großbritannien; Nordfrankreich; Mitteleuropa; Balkanhalbinsel; Südungarn.

f. *capitinivana* Bruand
albana Haworth, 1811, Lep. Brit.: 436 (*Tortrix*; nom. praeocc.); *capitinivana* Bruand, 1847, Mém. Soc. emul. Doubs 2, Cat. Microlép. Doubs: 45 (*Grapholitha*); *nigromaculana* (part.): Kennel, 1916, Pal. Tortr.: 496, t. 19 fig. 47 (♀) (*Semasia*).

ssp. *ussuriana* Car.
ussuriana Caradja, 1916, Iris 30: 60 (*Steganoptycha*). — Südostsibirien (Kasakewitch).

E. (P.) galactica nom. nov.*
galactica Obraztsov: diese Arbeit; ?*lucinana* (Kenn. i.l.) Caradja, 1916, Iris 30: 63 (*Semasia*; nom. nud.); *luciana* Kennel, 1919, Mitt. Münchn. Ent. Ges. 8: 81, t. 3 fig. 13 (*Semasia*). — Diese Arbeit: Taf. 9 Fig. 4 (♂-Genitalien). — Südukraine; Rumänien; Ostrußland; Sibirien.

f. *caliacrana* Car.
caliacrana Caradja, 1931, Mem. Sect. Stiint. Acad. Rom. (3) 7 (8): 329 (*Semasia*).

E. (P.) sardoensis (Rbl.) comb. nova *
sardoensis Rebel, 1935, Iris 50: 94 (*Semasia*). — Diese Arbeit: Taf. 11 Fig. 1 (Falter, ♂-Genitalien). — Sardinien.

E. (P.) suomiana (Hoffm.) comb. nova
suomiana Hoffmann, 1893, Stett. Ent. Ztg. 54: 142 (*Grapholitha*). — Staudinger & Rebel, 1901: 115, No. 2052; Kennel, 1921: 718; Benander, 1950: 120, fig. 11*d* (♂-Genitalien). — Schweden; Finnland.

E. (P.) abacana (Ersch.) comb. nova *
abacana Erschoff, 1877, Horae Soc. Ent. Ross. 12 (1876): 342 (*Grapholitha*); *opulentana* Christoph, 1881, Bull. Soc. Imp. Nat. Moscou 56 (3): 413 (*Grapholitha*; nom. praeocc.); *abascana* (err.): Kurentsov, 1950, Soobsch. Dalnevost. Fil. Akad. Nauk SSSR: 30 (*Semasia*). — Staudinger & Rebel, 1901: 114, No. 2047; Kennel, 1916: 506, t. 19 fig. 69, 70 (♂ ♀); Issiki, 1957: 60, t. 9 fig. 277 (♀). — Zentralasien; Süd- und Südostsibirien; ?Südkarpaten (Retyezat-Gebirge).

E. (P.) oculatana (Kenn.) comb. nova
oculatana Kennel, 1900, Iris 13: 143, t. fig. 19 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 2047*bis*; Kennel, 1916: 507, t. 19 fig. 71 (♀). — Ostsibirien (Irkutsk).

E. (P.) pupillana (Cl.)*
pupillana Clerck, 1759, Icones Ins.: t. 11 fig. 9 (non bin.) [Linné, 1761, Fauna Suec.: 349 (*Phalaena Tortrix*)]; *absinthiana* [Hübner, 1796—1799, Samml. eur. Schm., Tortr.: t. 6 fig. 34; non bin.] Haworth, 1811, Lep. Brit.: 457 (*Tortrix*); *absynthiana* Hübner, 1822, Syst.-alph. Verz.: 58 (*Olethreutes*). — Staudinger & Rebel, 1901: 114, No. 2042; Kennel, 1916: 507, t. 19 fig. 72 (♀); Pierce & Metcalfe, 1922: 71, t. 24 (♂ ♀-Genitalien); Benander, 1950: 118, fig. 11*e* (♂-Genitalien), t. 7 fig. 32 (Vorderflügel); Swatschek, 1958: 141 (Larvalmorphologie); Hannemann, 1961: 129, fig. 253 (♂-Genitalien), t. 13 fig. 21 (Falter). — Ganz Europa.

ssp. *saerdabana* ssp. nova
saerdabana Obraztsov, diese Arbeit: Taf. 10 Fig. 1—4, Taf. 11 Fig. 4 (Falter, ♂ ♀-Genitalien). — Nordpersien; ?Armenien.

E. (P.) mirificana (Peyer.)*
mirificana Peyerimhoff, 1876, Ann. Soc. Ent. France (5) 6: 590, t. 12 fig. 18 (*Grapholitha*). — Staudinger & Rebel, 1901: 113, No. 2023; Kennel, 1916: 508, t. 19 fig. 78 (♀); Hannemann, 1961: 129 nota, 220 fig. (♂-Genitalien), t. 22 fig. 2 (Falter). — Schweiz; Französische Alpen.

E. (P.) tetraplana (Möschl.) comb. nova *
tetraplana Möschler, 1866, Berl. Ent. Zschr. 10: 148 (*Grapholitha*). — Staudinger & Rebel, 1901: 114, No. 2045; Kennel, 1916: 509, t. 19 fig. 74 (♂); diese Arbeit: Taf. 11 Fig. 5 (♂-Genitalien). — Ostrußland; Armenien; Syrien.

E. (P.) paetulana (Kenn.) comb. nova
paetulana Kennel, 1900, Iris 13: 145, t. fig. 20 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 2043*bis*; Kennel, 1916: 509, t. 19 fig. 75 (♀). — Südural; ?Kleinasien.

E. (P.) esmodes Meyr.
esmodes Meyrick, 1937, Exot. Micr. 5: 99 (*Eucosma*). — Amsel, 1943: 312, t. 8 fig. 52 (♂-Genitalien); Wiltshire, 1957: 141, t. 13 fig. 52 (♂-Genitalien). — Irak.

Species incertae sedis

E. (P.) affectana (Kenn.) comb. nova
affectana Kennel, 1901, Iris 13 (1900): 267 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 2030*bis*; Kennel, 1916: 511, t. 19 fig. 80 (♀). — Transkaukasien.

E. (P.) albicostella (Trti. & Krüg.) comb. nova
albicostella Turati & Krüger, 1936, Mem. Soc. Ent. Ital. 15: 75, t. 11 fig. 25 (*Semasia*). — Kyrenaika.

E. (P.) astragalana (Stgr.) comb. nova
astragalana Staudinger, 1871, Berlin. Ent. Zschr. 14 (1870): 282 (*Grapholitha*). — Staudinger & Rebel, 1901: 114, No. 2029; Kennel, 1916: 513, t. 19 fig. 83 (Falter). — Ostrußland.

E. (P.) bactrana (Kenn.) comb. nova
bactrana Kennel, 1901, Iris 13 (1900): 269 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 2929*ter*; Kennel, 1916: 514, t. 20 fig. 1 (♂). — Südspanien; Nordwestafrika; Iran; ?Ferghana.

E. (P.) demissana (Kenn.) comb. nova
demissana Kennel, 1901, Iris 13 (1900): 268 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 2029*bis*; Kennel, 1916: 513, t. 19 fig. 84 (♂). — Andalusien.

E. (P.) directa Meyr.
directa Meyrick, 1912, Exot. Micr. 1 34 (*Eucosma*). — Taurus.

E. (P.) ephedrana (Chr.) comb. nova
ephedrana Christoph, 1877, Horae Soc. Ent. Ross. 12 (1876): 291, t. 8 fig. 64 (*Grapholitha*). — Staudinger & Rebel, 1901: 114, No. 2030; Kennel, 1916: 512, t. 19 fig. 82 (♂). — Palästina; Hyrkanien; Westturkestan (Kopet-Dagh).

E. (P.) giarabubensis (Trti.) comb. nova
giarabubensis Turati, 1930, Atti Soc. Ital. Sci. Nat. 69: 76, t. 2 fig. 2. Vertikalreihe, unten (*Semasia*). — Kyrenaika.

E. (P.) infirmana (Kenn.) comb. nova
infirmana Kennel, 1900, Iris 13: 153, t. fig. 29 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 2030*ter*; Kennel, 1916: 512, t. 19 fig. 81 (♀). — Zentralasien (Aschabad).

E. (P.) luciana (Chrét.)
luciana Chrétien, 1908, Le Nat. 30: 245 (*Epiblema*). — Razowski, 1961: 677, t. 93 fig. 27 (♀-Genitalien). — Südfrankreich.

E. (P.) lyrana (Snell.) comb. nova
lyrana Snellen, 1883, Tijdschr. v. Ent. 26: 208, t. 12 fig. 7, 7a (Falter, Kopf) (*Grapholitha, Semasia*). — Staudinger & Rebel, 1901: 115, No. 2054; Kennel, 1916: 528, t. 20 fig. 33 (♂). — Irkutsk; Amur.

E. (P.) polyxena Meyr.
polyxena Meyrick, 1937, Iris 51: 179 (*Eucosma*). — Yünnan.

E. (P.) resupinatana (Kenn.) comb. nova
resupinatana Kennel, 1901, Iris 13 (1900): 270 (*Semasia*). — Staudinger & Rebel, 1901: 262, No. 1997*bis*; Kennel, 1916: 516, t. 20 fig. 5 (♂). — Schweiz (Wallis).

E. (P.) teliferana (Chr.) comb. nova
teliferana Christoph, 1881, Bull. Soc. Imp. Nat. Moscou 56 (3): 415 (*Grapholitha*). — Staudinger & Rebel, 1901: 114, No. 2025; Kennel, 1916: 528, t. 20 fig. 32 (♂). — Südussuri.

E. (P.) verecundana (Car.) comb. nova
verecundana Caradja, 1916, Iris 30: 63 (*Semasia*). — Alai-Gebirge.

Appendix

Hemimene marmarocyma Meyrick, ♂, Tien-Mu-Shan, 5300′, June 1932 (Höne), Präp. No. 6681 (BM) ist abgebildet auf Taf. 10 Fig. 1, 4, Taf. 11 Fig. 2, diese Arbeit.

Kommentar zum Katalog der *Eucosma*-Arten

1. *Eucosma* (*Eucosma*) *conformana* (Mn.). — Typen der *conformana*: Lectotypus, Männchen (Genitalpräparat No. V. 38), „Type 1872 z.b.G." (keine genaueren Angaben); Lectoparatypus, Männchen, Ragusa, Dalmatien, 1868 (Mann); beide im Wiener Naturhistorischen Museum. Typen der *significantana* Kenn.: Lectotypus, Männchen (Genitalpräparat No. B. 33), Mazedonien (Kr.); Lectoallotypus, Weibchen (Genitalpräparat No. B. 34), Beirut, Syrien (CR.); beide im Z.M.B.

2. *E.* (*E.*) *gypsatana* (Kenn.). — Holotypus, Männchen (Genitalpräparat No. 5730), Akschehir, Anatolien, 1900 (Caradja, No. 2011; Walsingham, No. 71784); B.M.

3. *E.* (*E.*) *albarracina* Hartig. — Blieb mir unbekannt. Nach der Angabe des aufstellenden Autors gehört diese Art zur *fulvana-expallidana*-Gruppe und unterscheidet sich von diesen Arten durch die goldgelben Vorderflügel, einen hellen länglichen Fleck nach dem Costalumschlag und einen aus hellen und dunklen Schuppen gebildeten Fleck vor und unterhalb der Mitte der Mittelzelle des Vorderflügels. Das die Originalbeschreibung begleitende Photo stellt zweifellos eine *Eucosma*-Art dar, welche einen deutlichen Vorderflügelcostalumschlag hat und eher erinnert an *albidulana* oder *albuneana*, aber anscheinend mit keiner von diesen identisch ist.

4. *E.* (*E.*) *rigidana* (Snell.). — Lectotypus, Männchen (Genitalpräparat No. 2638), Insel Askold, 1878 (D.; v. Hed.); M.L. Kennel (1916) hatte ein Weibchen und er stellte *rigidana* irrtümlicherweise in die Gattung *Semasia*.

5. *E.* (*E.*) *monstratana* (Rbl.). — Lectotypus, Männchen (Genitalpräparat No. 2048), Schanfigg bei Chur, 1600 m, 16.VII.1903 (Stange; der Falter und seine Genitalien wurden von Hannemann, 1961, abgebildet); Lectoallotypus, Weibchen (Genitalpräparat No. V. 28), gleiche Zettelangaben; Wiener Naturhistorisches Museum.

6. *E.* (*E.*) *balatonana* (Osth.). — Als "var." *balatonana* beschrieb Osthelder (1937) kleinere Exemplare einer Art aus Ungarn, die er mit *expallidana* konspezifisch zu sein vermutete. In seiner Sammlung (jetzt in der Z.S.M.) befinden sich mehrere Exemplare der *balatonana*, aber von einem besonderen Interesse sind jene zwei Männchen, die Osthelder als Typen bezeichnete. Eines von diesen, als "Holotyp" bezettelt, stammt aus Puszta Peszér (12.VII.1929, L. Osthelder; Genitalpräparat No. 3-Obr. 8/8 58) und kann nur als ein Pseudotypus betrachtet werden, da Osthelder in der Originalpublikation alle Exemplare aus dieser Lokalität der namenstypischen *expallidana*-Form zuzog. Nur die Exemplare aus Vörs (Komitat Somogy) behandelte er als *balatonana*. Deshalb bezeichne ich das zweite der beiden erwähnten Männchen als Lectotypus der *balatonana*, obwohl es von Osthelder als eine "Cotype" bezettelt wurde. Der Fundortzettel dieses Exemplares lautet: "Hungaria, Vörs, Com. Somogy, 15.—30.VII.1932, E. Pfeiffer" (Genitalpräparat No. M. 1053); die Vorderflügellänge ist 6,5 mm.

Wie eine Genitaluntersuchung zeigt, ist dieser Lectotypus mit *Eucosma danicana* Schantz konspezifisch. Im Einklang mit dem neuen International Code (1961, 1964: Artikel 15 und 45*e*) hat der Name *balatonana* eine Priorität vor *danicana*, obwohl er für die Bezeichnung einer Variation vorgeschlagen wurde. Dementsprechend muß *danicana* als ein jüngeres Synonym von *balatonana* zurücktreten. Der obenerwähnte Pseudotypus gehört zu *Pelochrista* (*Pseudeucosma*) *modicana* (Z.). Weitere aus der Sammlung Osthelder stammende, als *balatonana* bestimmte und mit *danicana* artlich zusammengehörige Exemplare (alle Männchen) sind: 1. Lochhauer Sandberg, Oberbayern, 19.VII.-1938, am Licht (F. Daniel) (Genitalpräparat No. M. 1050); 2. Nyieb tor, Bator-Gebirge, Westungarn, 9.VIII.1934 (F. Daniel) (Genitalpräparat No. M. 1051); 3. Vörs, Komitat Somogy, Ungarn, 9.VII.1931 (L. Osthelder). Zwei Männchen, die auch als *balatonana* bestimmt wurden, gehören zu *Eucosma* (*Eucosma*) *fulvana* (Stph.): Lochhauer Sandberg, Oberbayern, 3.VIII.1938, am Licht (F. Daniel) (Genitalpräparate No. M. 1049 und No. 877-Forster). Die sämtlichen Exemplare haben folgendes gemeinsam: alle sind nicht ganz frisch und gehören zu den Zwergen (Vorderflügellänge: 5—6,5 mm).

7. *E.* (*E.*) *expallidana* (Hw.). — Die von Osthelder (1937) als eine Form dieser Art beschriebene *balatonana* hat mit *expallidana* nichts zu tun und stellt eine andere, oben näher besprochene Art dar.

8. *E.* (*E.*) *flavispecula* Kuzn. — Kuznetzov (1964) verglich diese Art mit *scorzonerana*, aber m.E. steht sie eher der *fulvana* näher und ist vielleicht ihre geographische Unterart. Aus dem Wiener Naturhistorischen Museum hatte ich folgende Exemplare, die ich als *flavispecula* identifiziere, zur Ansicht; ein Männchen aus Hansag, Burgenland, Österreich, 16.VII.1955 (F. Kasy); ein Männchen (Genitalpräparat No. 1344), Einrub, 25.VII.1921; ein Männchen von den Zitzmannsdorfer Wiesen, südlich von Weiden am See, Nordburgenland, 24.VI.1961 (F. Kasy); ein Männchen (Genitalpräparat No. 1372), Krs Balaton bei Vörs, Ungarn, 21.—29.VI.1936 (J. Klimesch); ein Weibchen (Genitalpräparat No. 1379), Bozen, Südtirol, 24.VII.1913 (H. Zerny). Im A.M.N.H. befindet sich noch ein weiteres Männchen (Genitalpräparat No. 758-Obr.), Illmitz, Burgenland, 11.VII.1954 (H. Reisser). Ähnliche Stücke sah ich auch aus der Südukraine (Nikolaew, Berdiansk).

9. *E.* (*E.*) *individiosana* (Kenn.). — Holotypus, Männchen (Genitalpräparat No. B. 44), Lambèze, Algerien; Z.M.B. Die Abbildung dieses Exemplares bei Kennel (1921: t. 21 fig. 23) ist dunkler als das Original, das an Färbung anscheinend etwas eingebüßt hat. Die schwarzen Pünktchen der Spiegelstelle sind beim Holotypus auf den beiden Vorderflügeln etwas asymmetrisch geordnet und die Kennelsche Figur gibt deren Anordnung am linken Vorderflügel wieder. Auf dem rechten Vorderflügel stehen zwei von diesen Pünktchen in der Länge, nicht vertikal wie auf dem linken.

10. *E.* (*E.*) *victoriana* (Kenn.). — Lectotypus, Männchen (Genitalpräparat No. B. 27), Sajan; Lectoallotypus, Weibchen (ohne Hinterleib), Sajan; beide im Z.M.B. Das Männchen ist etwas beschädigt, aber die meisten Zeichnungselemente der Vorderflügel sind gut erkennbar. Dieses unterscheidet sich stark vom einzig bekannten Weibchen (Lectoallotypus) und die von Kennel (1919) veröffentlichte Abbildung des Männchens scheint nach einem anderen Exemplar angefertigt zu sein. Das Männchen gehört zweifellos zur Gattung *Eucosma*; das Weibchen, dessen Genitalien fehlen, macht für diese Gattung einen etwas fremden Eindruck und erinnert eher an eine *Epiblema*-Art.

GESAMTREGISTER

ZU

„DIE GATTUNGEN DER PALAEARKTISCHEN TORTRICIDAE" 1954—1968

zusammengestellt

von

B. J. LEMPKE
Amsterdam

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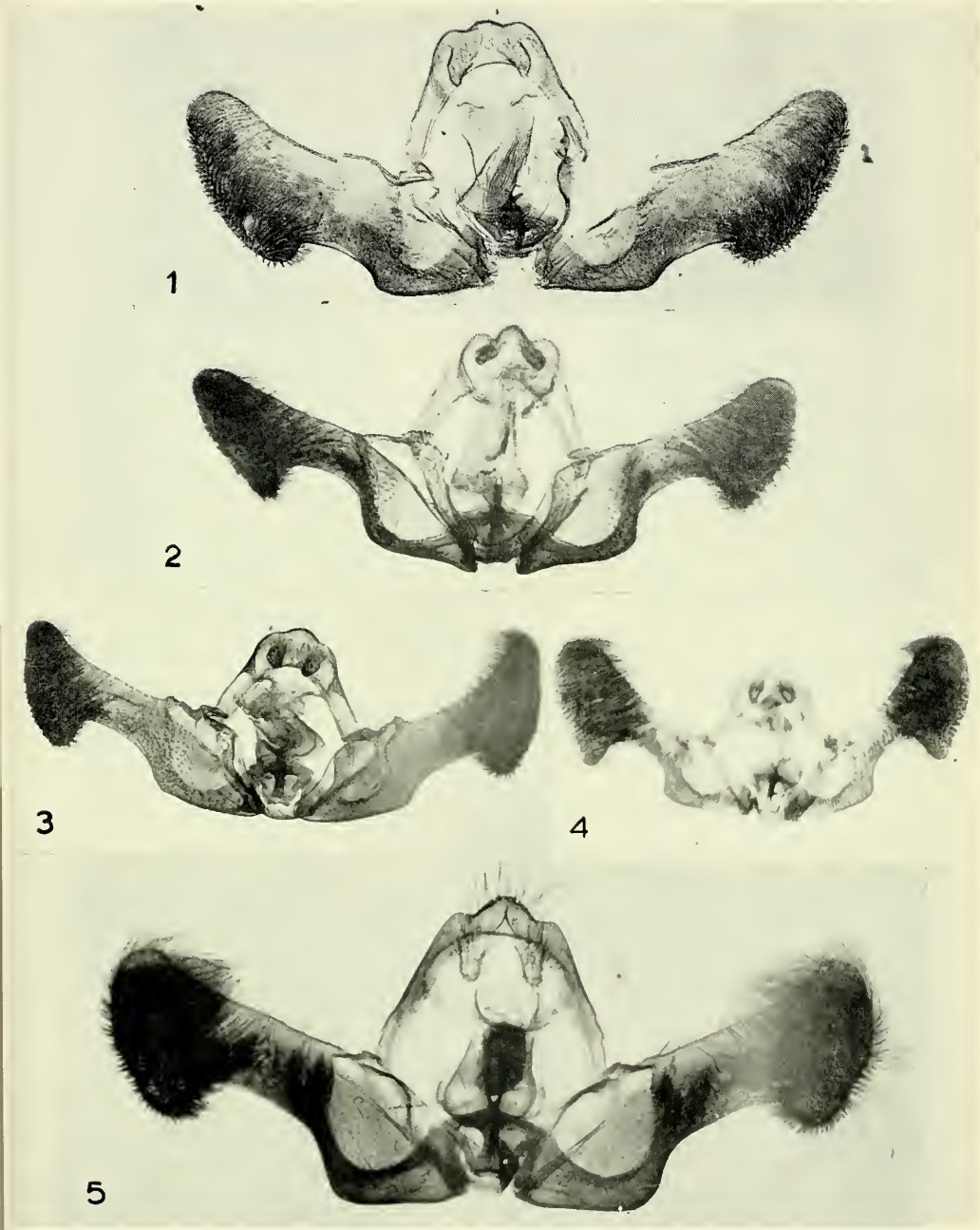
POSTHUMOUS PUBLICATIONS OF THE LATE Dr. N. S. OBRAZTSOV

1. Neotropical Microlepidoptera, IX. Revision of genus *Pseudatteria* (Lepidoptera: Tortricidae). — Proc. U.S. Nat. Mus. (no 3535) 118: 577—622, Fig. 1—12, Pl. 1—43, 1966.
2. Neotropical Microlepidoptera XI. Revision of genus *Idolatteria* (Lepidoptera: Tortricidae). — Loc. cit. (no. 3543) 119: 1—12, Pl. 1—8, 1966.
3. On the correct usage of two names of the genus-group in the Tortricidae, with the proposal of a new generic name (Lepidoptera).— Entomologist's Gazette 17: 141—147, 1966.
4. Genera Tortricidarum. Check list of the genera and subgenera belonging to the families Tortricidae (Ceracidae, Chlidanotidae, Schoenotidae and Olethreutidae included) and Phaloniidae. — Journ. New York Ent. Soc. 75: 1—11, 3.V.1967.
5. Some apocryphal species of the Tortricinae (Lepidoptera, Tortricidae). — Loc. cit. 75: 34, 1966.
6. Notes on the genus *Homonopsis* V. Kuznetsov (Lepidoptera, Tortricidae). — Ent. Berichten 27: 173—175, 1967.
7. Die Gattungen der palaearktischen Tortricidae III. Addenda & Corrigenda, 2. Teil. Notes on the Palaearctic Laspeyresiini. — Tijdschrift voor Ent. 110: 13—36, Fig. 1—2, Pl. 1—2, 1967.
8. Die Gattungen der palaearktischen Tortricidae. II. Die Unterfamilie Olethreutinae, 7. Teil. Tribus Eucosmini (Heinr. 1923). Fortsetzung. — Tijdschrift voor Entomologie 110: 65—88, Fig. 1—24, Pl. 3—10.
9. Die Gattungen der palaearktischen Tortricidae. II. Die Unterfamilie Olethreutinae. Tribus Eucosmini (Heinr. 1923), 8. Teil und Schluss, mit einem Gesamtregister auf alle Teile, zusammengestellt von B. J. Lempke. — The present article.

In press:

10. Descriptions and records of South Asiatic Laspeyresiini (Lepidoptera, Tortricidae).
11. Notes on and descriptions of *Aphelia, Clepsis* and *Choristoneura* species (Lepidoptera, Tortricidae).
12. Records and descriptions of Palaearctic and South Asiatic Laspeyresiini (Lepidoptera, Tortricidae).



Taf. 1. *Eucosma*-Arten. Abb. 1, *Eucosma sordicomana* Stgr., ♂, Präp. No. M 742, Mti Simbruini, Italien (Mus. München). Abb. 2, *Eucosma medullana* Stgr., ♂, Ohrid Umgebung, Mazedonien, 700 m, 27.VI.1954 (J. Thurner), Präp. No. 67 (Mus. Wien). Abb. 3, *Epiblema significantana* Kennel, Lectotypus, ♂, Präp. No. B33, Mazedonien (Kr.) (Mus. Berlin). Abb. 4, *Epiblema gypsatana* Kennel, Typus ♂, Präp. 5730, "Achr.", Anatolien, 1900 (Caradja, No. 2011, Wlsm. No. 71784). (BM). Abb. 5, *Grapholitha rigidana* Snellen, ♂, Lectotypus, Insel Askold, 1878, Präp. No. 2638 (Mus. Leiden)

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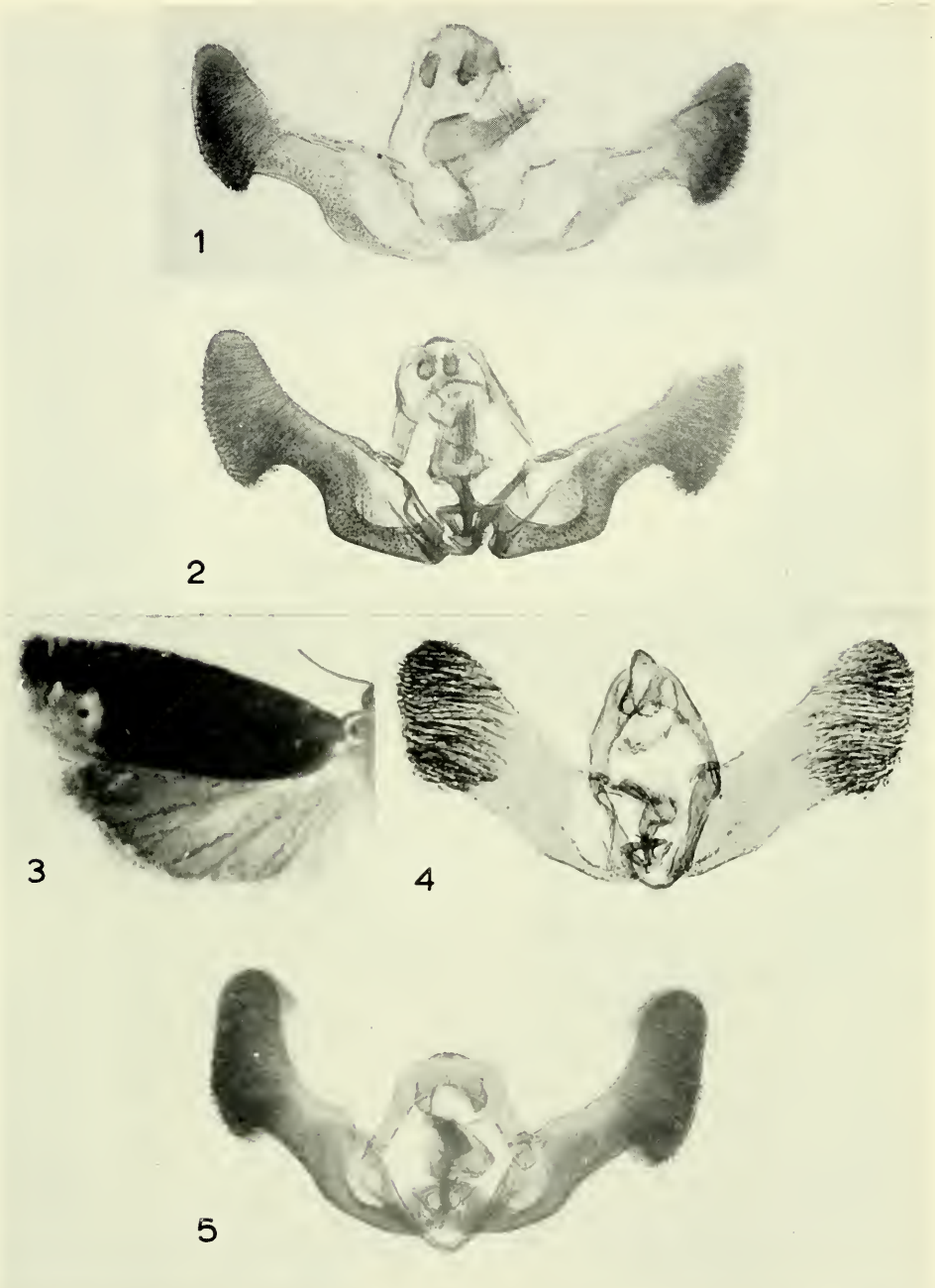

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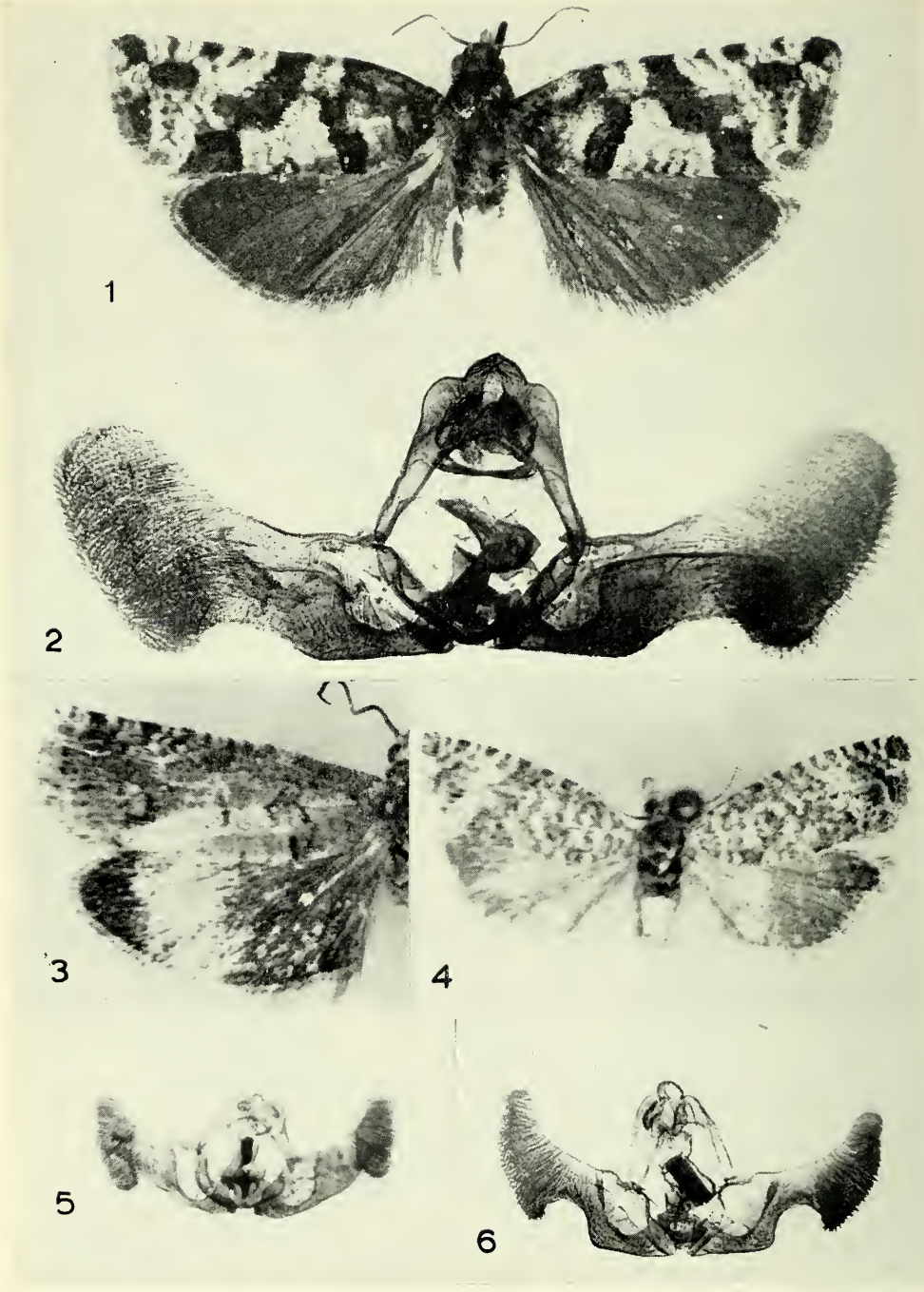

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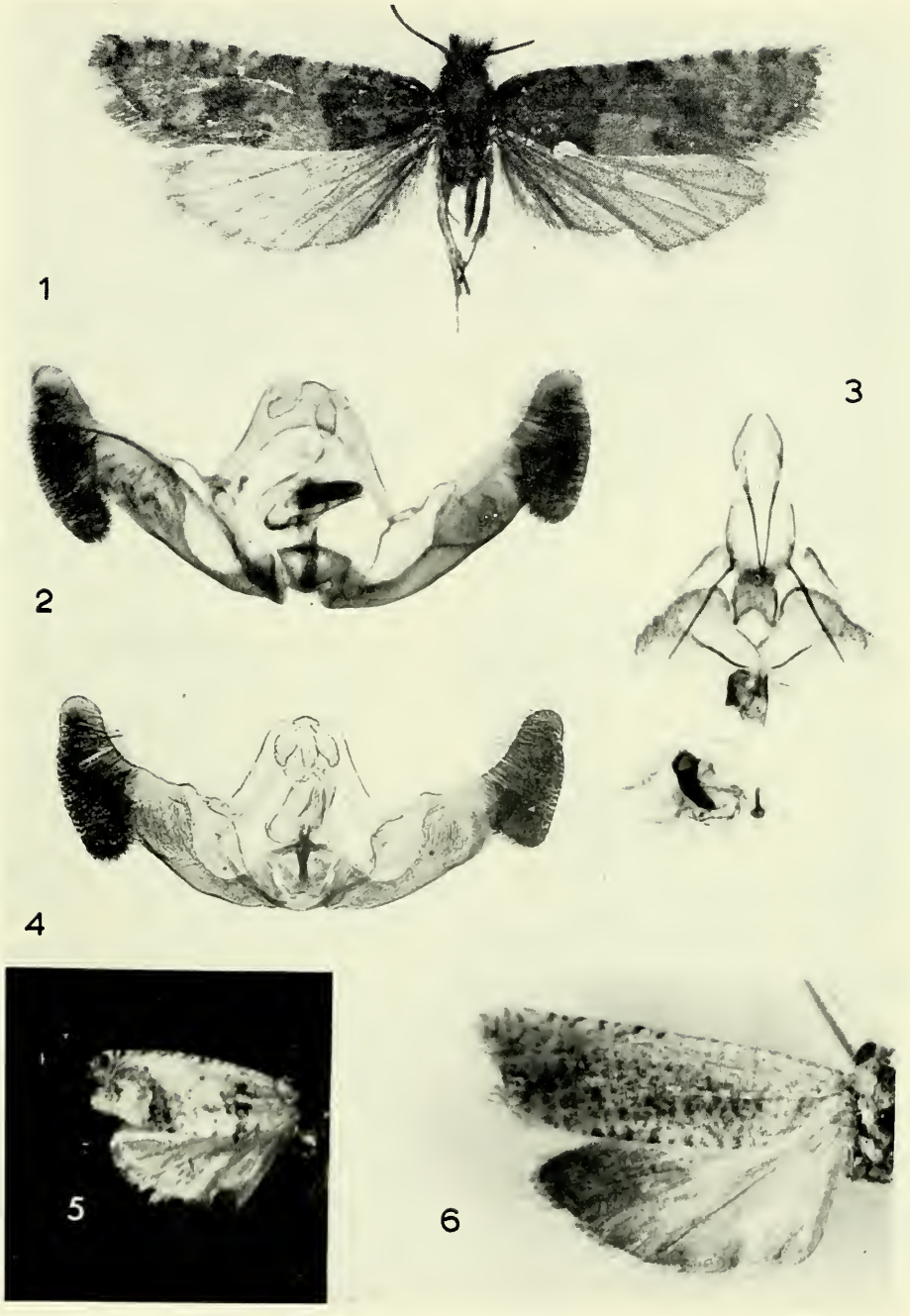

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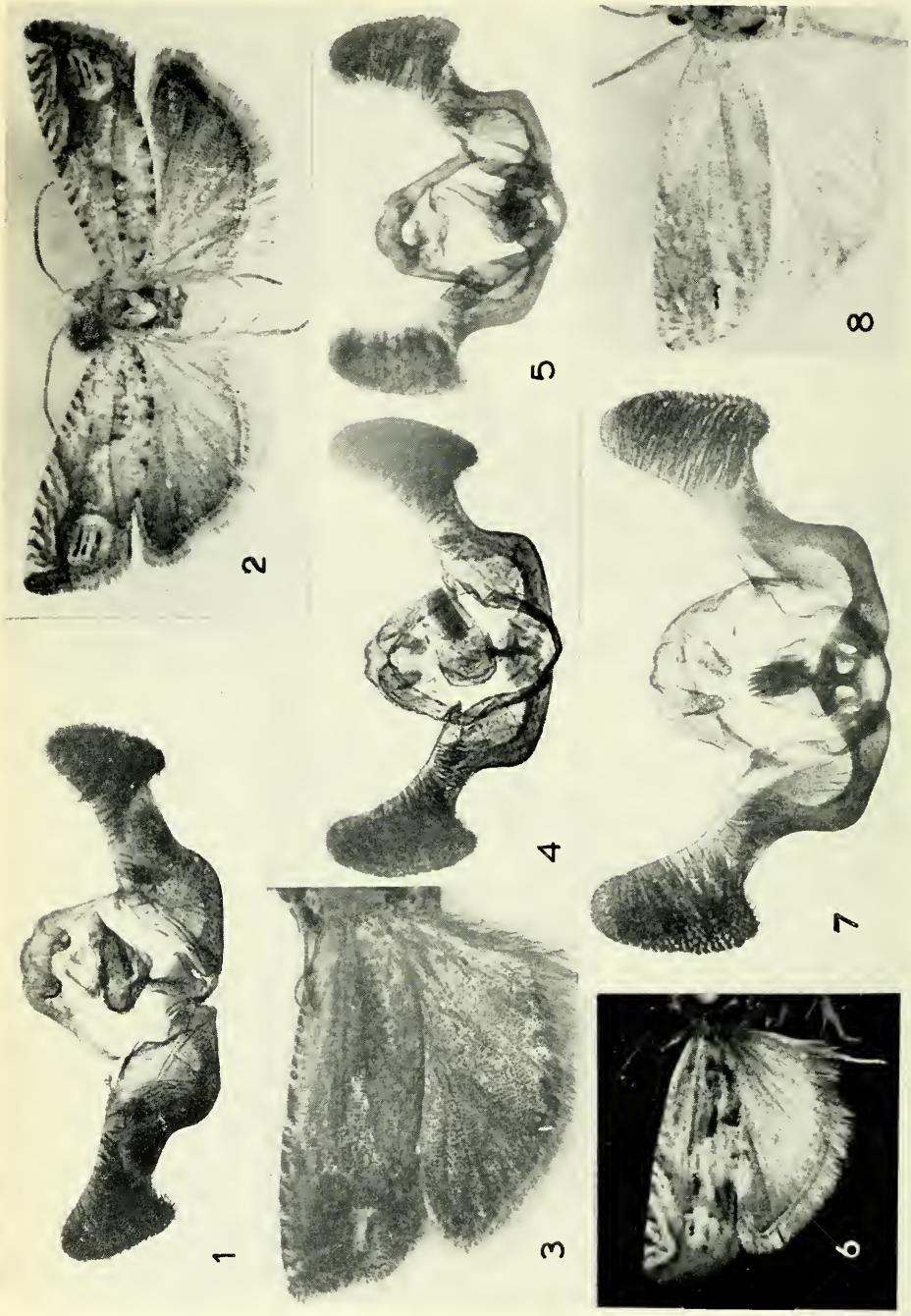
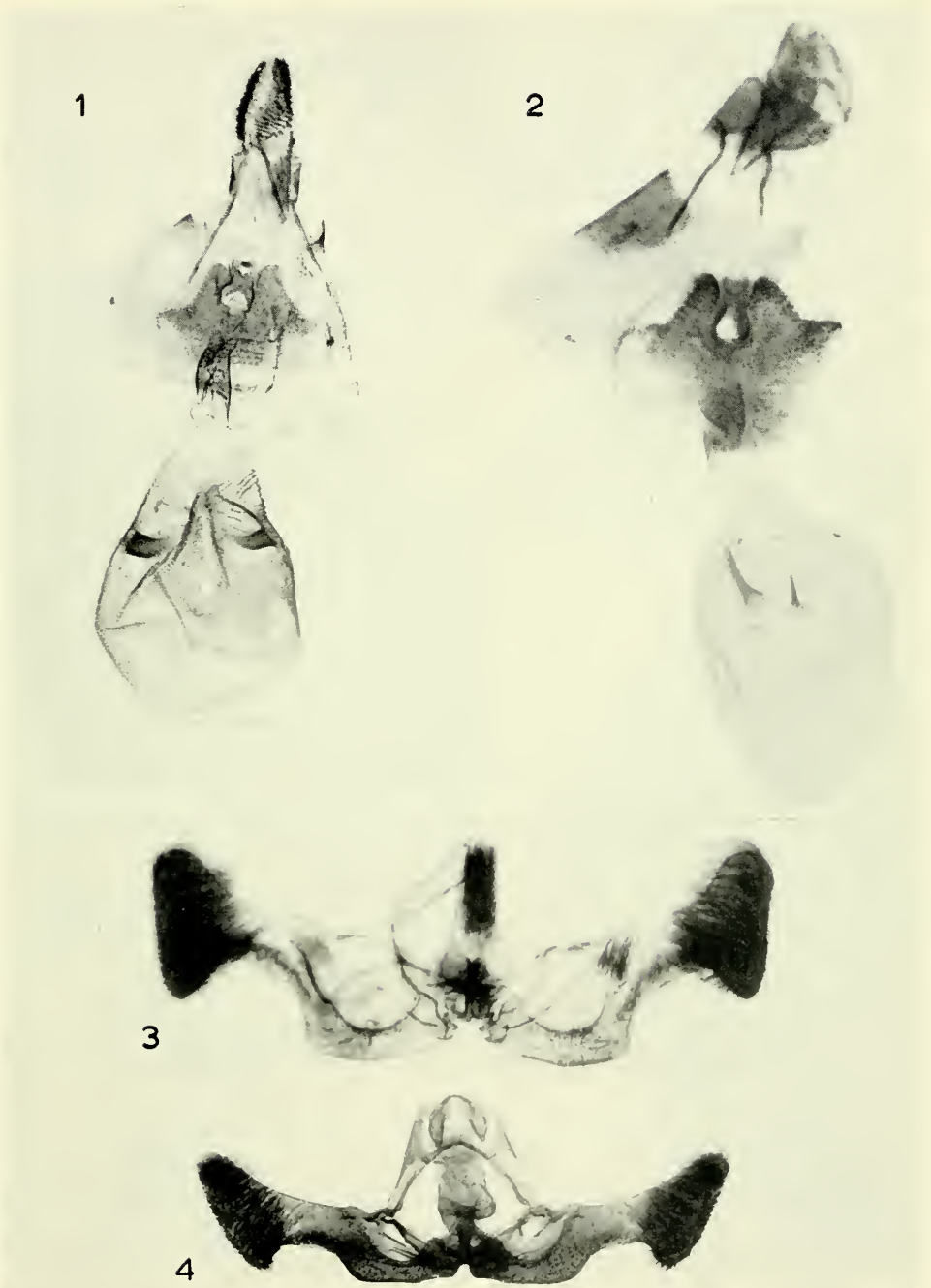
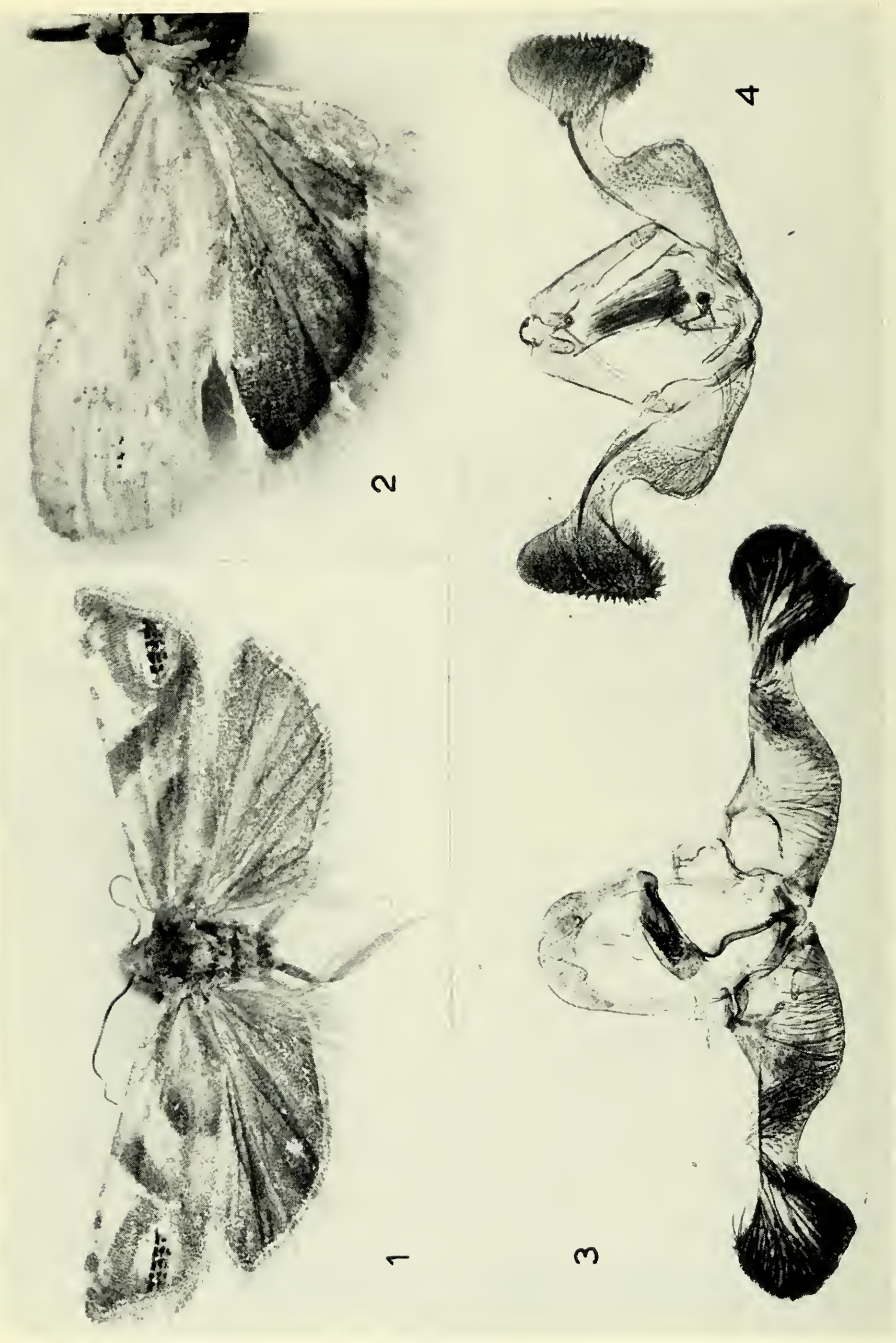


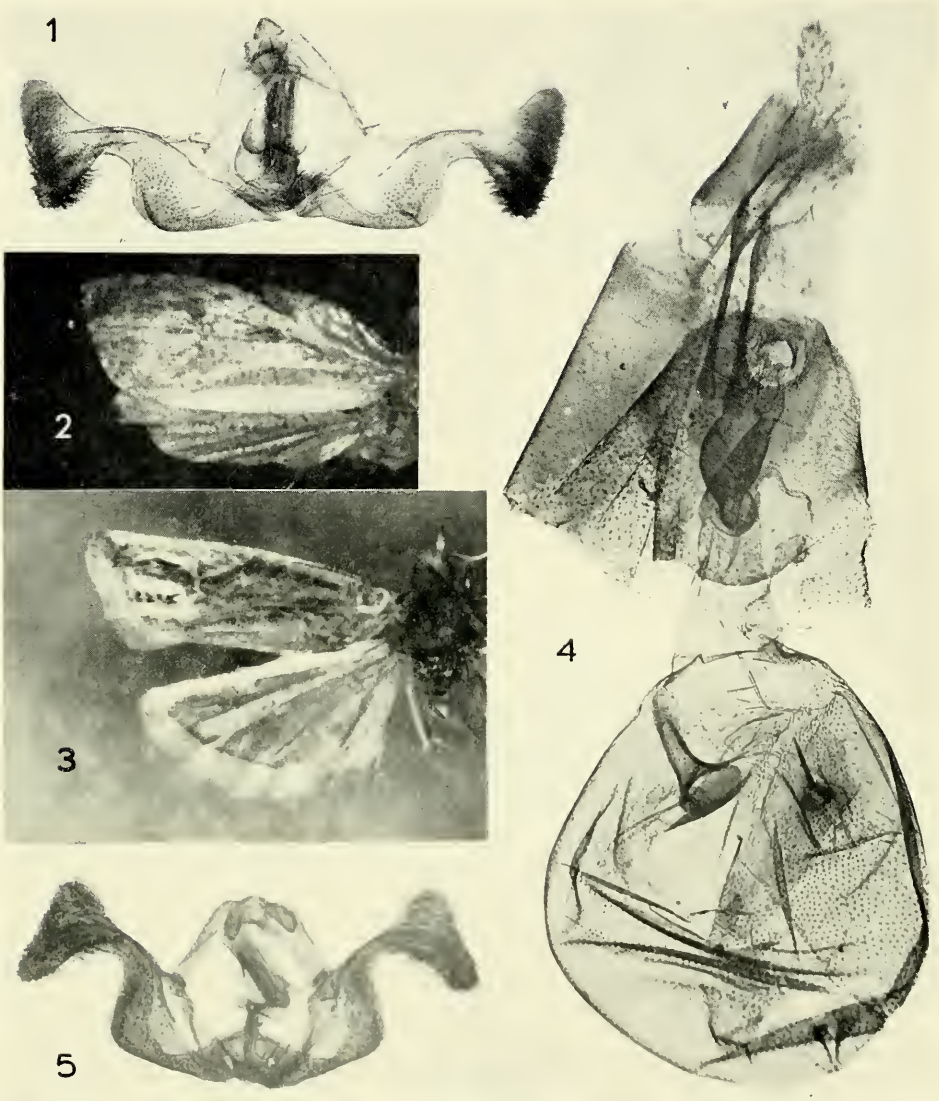
Taf. 8. *Eucos(ma*-Arten. Abb. 1, *Semasia gradensis* Galvagni, Lectoparatypus, ♂, Insel Grado, Küstenland, Pfingstern 1905 (Galvagni) (Mus. Wien). Abb. 2, *Semasia amellana* Preissecker, Lectotypus, ♂, 7.VIII.1903, Präp. No. V. 39 (Mus. Wien). Abb. 3, *Thiodia sinensis* Wlsm., Lectotypus, ♂, Lingpo, Chekiang, S. China, 1.VI.1886 (Leech, No. 60151) (BM). Abb. 4, *Semasia krygeri* Rebel, ♀, Lectotypus, "410 Brannes, Sjaelland, *Artemisia maritima* Galle, 2.VI.1935 (Kryger), 19.VI.1935", Präp. No. V. 34 (Mus. Wien). Abb. 5, *Thiodia sinensis* Wlsm., Holotypus, ♂, wie Abb. 3, Präp. No. 5758 (BM). Abb. 6, *Semasia krygeri* Rebel, wie Abb. 4, Falter. Abb. 7, *Grapholitha glebana* Snell., ♂, Lectotypus, Tscherna jama, Amur, 11.VI.1877, Präp. No. 2531 (Mus. Leiden). Abb. 8,



Taf. 9. *Eucosma*-Arten. Abb. 1, *Semasia amellana* Preissecker, Lectoallotypus, ♀, Mödling, Österreich, 19.VIII.1908 (Richardhof), Präp. No. V. 40 (Mus. Wien). Abb. 2, *Semasia krygeri* Rebel, ♀, Lectotypus, "410, Bramnes, Sjaelland, *Artemisia maritima* Galle, 2.VI.1935 (Kryger), 19.VI.1935", Präp. No. V. 34 (Mus. Wien). Abb. 3, *Thiodia intacta* Wlsm., Holotypus, ♂, Japan, 1886, Pryer, No. 70172 (BM). Abb. 4, *Eucosma* (*Phaneta*) *galactica* Obr. n.n., Holotypus, ♂, Emba, Uralsk, Präp. M. 1042 (Mus. München)



Taf. 10. *Eucosma*-Arten. Abb. 1, *Eucosma* (*Phaneta*) *pupillana saerdabana* Obr., Holotypus, ♂, Persia S., Elburs mts. c.s., Särdab-Tal, Vandarban, 1900—2000 m, 10—14.VII.1937 (E. Pfeiffer & W. Forster) (Mus. München). Abb. 2, *Thiodia intacta* Wals., Holotypus, ♂, Japan, 1886 (Pryer) No. 70172, Präp. No. 5759. Abb. 3, *Hemimene marmarocyma* Meyr., ♂, Tien-Mu-Shan, China, 5300′, June 1932 (Höne), Präp. No. 6681 (BM). Abb. 4, *Eucosma* (*Phaneta*) *pupillana saerdabana* Obr., Falter wie Abb. 1



Taf. 11. *Eucosma*-Arten. Abb. 1, *Semasia sardoensis* Rebel, Lectotypus, ♂, Uras, Sardinien, 16.X.1934 (Predota), Präp. No. V. 37 (Mus. Wien). Abb. 2, *Hemimene marmarocyma* Meyrick, ♂, Tien-Mu-Shan, China, 5300′, June 1932 (Höne), Präp. No. 6681 (BM). Abb. 3, dasselbe wie Abb. 1, Falter. Abb. 4, *Eucosma* (*Phaneta*) *pupillana saerdabana* Obr., Allotypus, ♀, Persia S., Elburs Mts., Särdab-Tal, Vandarban, 1900—2200 m, 10—14.VII.1937 (E. Pfeiffer & W. Forster), Präp. 2-Obr. 8/8/58 (Mus. München). Abb. 5, *Eucosma* (*Phaneta*) *tetraplana* Möschl., ♂, Achyr Dagh. s., Bertiz Jaila, 1800 m. 9—13.VI.1929, Marash, N. Syrien (E. Pfeiffer) (Mus. München)

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SPIDERS FROM SOUTH NEW GUINEA X

by

FR. CHRYSANTHUS O.F.M. Cap.

Oosterhout (N.B.)

Abstract

In the present paper, being the last part of this series, 21 species belonging to the family Salticidae are dealt with. All have been collected by Br. Monulf in the environs of Merauke (1956—1957) and Mindiptana (1958—1965). The species discussed are: *Linus fimbriatus* (Doleschall), *Bavia aericeps* Simon, *Diolenius amplectens* Thorell, *Cytaea frontaligera* (Thorell), *C. nimbata* (Thorell), *C. mitellata* (Thorell), *Euryattus bleekeri* (Doleschall), *E. porcellus* Thorell, *Trite longula* (Thorell), *Sandalodes bernsteini* (Thorell), *Bathippus macrognathus* (Thorell), *B. papuanus* (Thorell), *Palpelius beccarii* (Thorell), *Plexippus paykullii* (Audouin), *Zenodorus durvillii* (Walckenaer), *Mopsus mormon* Karsch, *Poecilorchestes decoratus* Simon, *Cosmophasis bitaeniata* (Keyserling), *C. micarioides* (L. Koch), *Dendryphantes laticeps* Strand and *Menemerus bivittatus* (Dufour).

A list of all species discussed in this series is added.

Acknowledgements

I wish to express my sincere thanks to the following colleagues who kindly sent me material for study from their respective museums: Dr. L. van der Hammen (Rijksmuseum van Natuurlijke Historie, Leiden), Dr. O. Kraus (Senckenberg Museum, Frankfurt a.M.; at some places indicated as SMF in the text), Dr. G. Rack (Zoologisches Museum, Hamburg), Dr. D. Guiglia (Museo Civico di Storia Naturale, Genova), Dr. M. Hubert (Muséum National d'Histoire Naturelle, Paris), Mr. D. J. Clark (British Museum, Natural History, London), and Dr. J. Cooreman and Mr. J. Kekenbosch (Institut royal des sciences naturelles de Belgique, Bruxelles).

A special word of thanks is due to Dr. L. van der Hammen for his continuous help and advice in my study of the New Guinean spiders during the last ten years.

Furthermore I am grateful to the Netherlands Organization for the Advancement of Pure Research (Z.W.O.) and to the Consiglio Nazionale delle Ricerche, for grants which enabled me to study the rich Thorell collection in Genoa.

ECRIBELLATAE (concluded)

SALTICIDAE

PLURIDENTATI

Boethinae

Linus Peckham, 1885

Linus fimbriatus (Doleschall, 1859)

Fig. 1—6

Doleschall, 1859, Act. Soc. Sci. Ind.-Neerl. 5: 22, Pl. 5 Fig. 8, ♀ ♂ (*Salticus*).
Thorell, 1878, Ann. Mus. civ. stor. nat. Genova 13: 269, ♂ (*Sinis*).
——, 1881, ibid. 17: 499, ♀ (*Sinis*).
Simon, 1901, Hist. nat. Araignées 2: 411, Fig. 435—443, ♂.

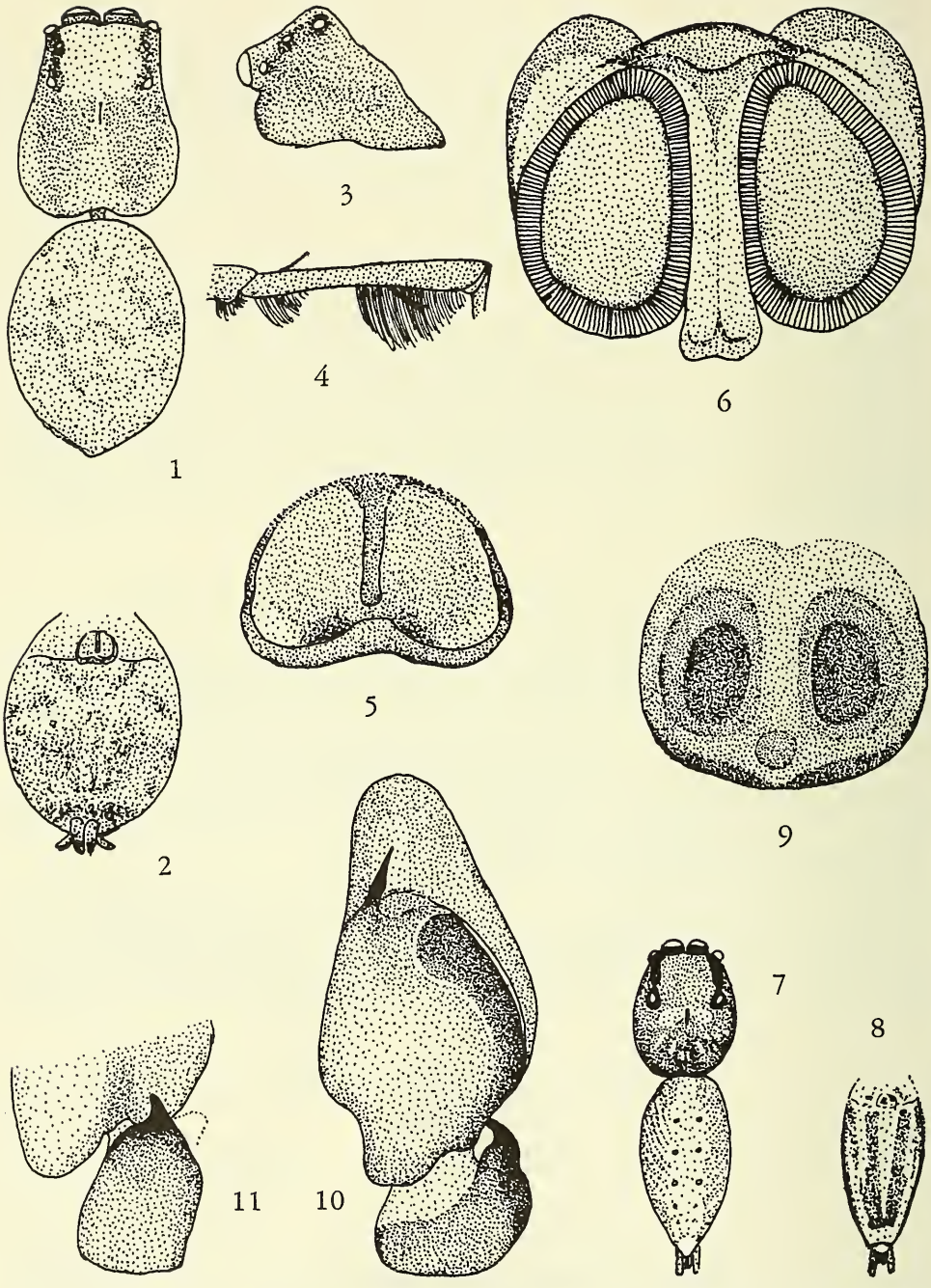

Fig. 1—6, *Linus fimbriatus* (Doleschall). 1, ♀; 2, id. abdomen, ventral view; 3, id. cephalothorax, lateral view; 4, id. tibia, lateral view; 5, id. epigyne; 6, id. vulva. Fig. 7—11. *Bavia aericeps* Simon. 7, ♀; 8, id. abdomen, ventral view; 9, id. epigyne; 10, ♂, left palp, ventral view; 11, id. part of left palp, lateral view. Fig. 1—3: × 7; 4: × 5; 5: × 35; 6: × 60; 7, 8: × 3; 9: × 70; 10, 11: × 40

Three females from Merauke (1956—1957) are identical with the female of this species in the Doleschall collection (Rijksmuseum van Natuurlijke Historie, Leiden), probably the holotype; their body length varies from 7.5—9.0 mm.

The type locality is Amboina, the species has also been recorded from Ceylon to New Guinea and Australia, and even from Madagascar (Roewer, 1954: 935; Bonnet, 1957: 2482).

Thiodininae

Bavia Simon, 1877

Bavia aericeps Simon, 1877

Fig. 7—11

Simon, 1877, Ann. Soc. ent. France (5) 7: 61, ♂.
L. Koch, 1879, Arachn. Austr. 1 (2): 1146, Pl. 99 Fig. 6, 7, ♀ ♂ (*Acompse suavis*).
Simon, 1901, Hist. nat. Araignées 2: 470, Fig. 529—531, ♂.

In the Zoologisches Museum, Hamburg, two syntypes of L. Koch's *Acompse suavis* are preserved, viz. one adult and one young female. Simon established the synonymy of this species with his *Bavia aericeps*; in "Berichtigungen", published in 1883 at the end of "Die Arachniden Australiens" (vol. 1 (2): 1477), Keyserling said: "Herr E. Simon war so liebenswürdig mir mitzuteilen, dass Acompse suavis L. K. p. 1146, identisch sei mit der von ihm beschriebenen Bavia aericeps".

I could compare a *Bavia* female (12 mm) from Merauke (1956—1957) with Koch's syntypes: they are identical, my specimen being somewhat darker; Koch mentioned this darker form. His figure of the epigyne (Fig. 6d) is misleading: in the adult syntype it is as in my Fig. 9; in Fig. 6a he omitted the lateral notches in the labium.

The male syntype is lost. Three males (11—14 mm) from Mindiptana (1959) fully agree with Koch's description and figures; the pattern is as in the female, the colours are darker.

The type locality of *aericeps* is Manila (Philippines); Koch's specimens of *suavis* originated from Huahine, Rayatea, Tahiti. The geographical distribution extends from Sumatra and the Philippines into the Pacific area (Roewer, 1954: 979; Bonnet, 1955: 871).

Diolenius Thorell, 1869

Diolenius amplectens Thorell, 1881

Fig. 12—18

Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 412, ♀.

Several *Diolenius* females from Mindiptana (1958—1965) fully agree with Thorell's description and with types from the Aru Is. and Ramoi Riv. (Vogelkop, New Guinea) (Genoa Museum); the central part of the epigyne may be uniform brownish yellow. The body length varies from 6—8 mm. Strand (*Abh. senckenb. Naturf. Ges.* 34 [1911]: 179) mentioned two females from Terangan (Aru Is.).

Male. About an equal number of *Diolenius* males were collected in the same years and the same locality as the females: they certainly belong to *amplectens,* no other species of this genus being present in our collection. In nearly all details they are like the females; the abdomen slenderer and marked by two longitudinal grey bands (Fig. 16); first legs more slender and twice the length of those of the female (Fig. 15, 17; ♀ leg: × 20; ♂ leg: × 10); the metatarsus with short spines (in the figure I omitted the dense fringe of rather long hairs, running along the underside of the tibia,

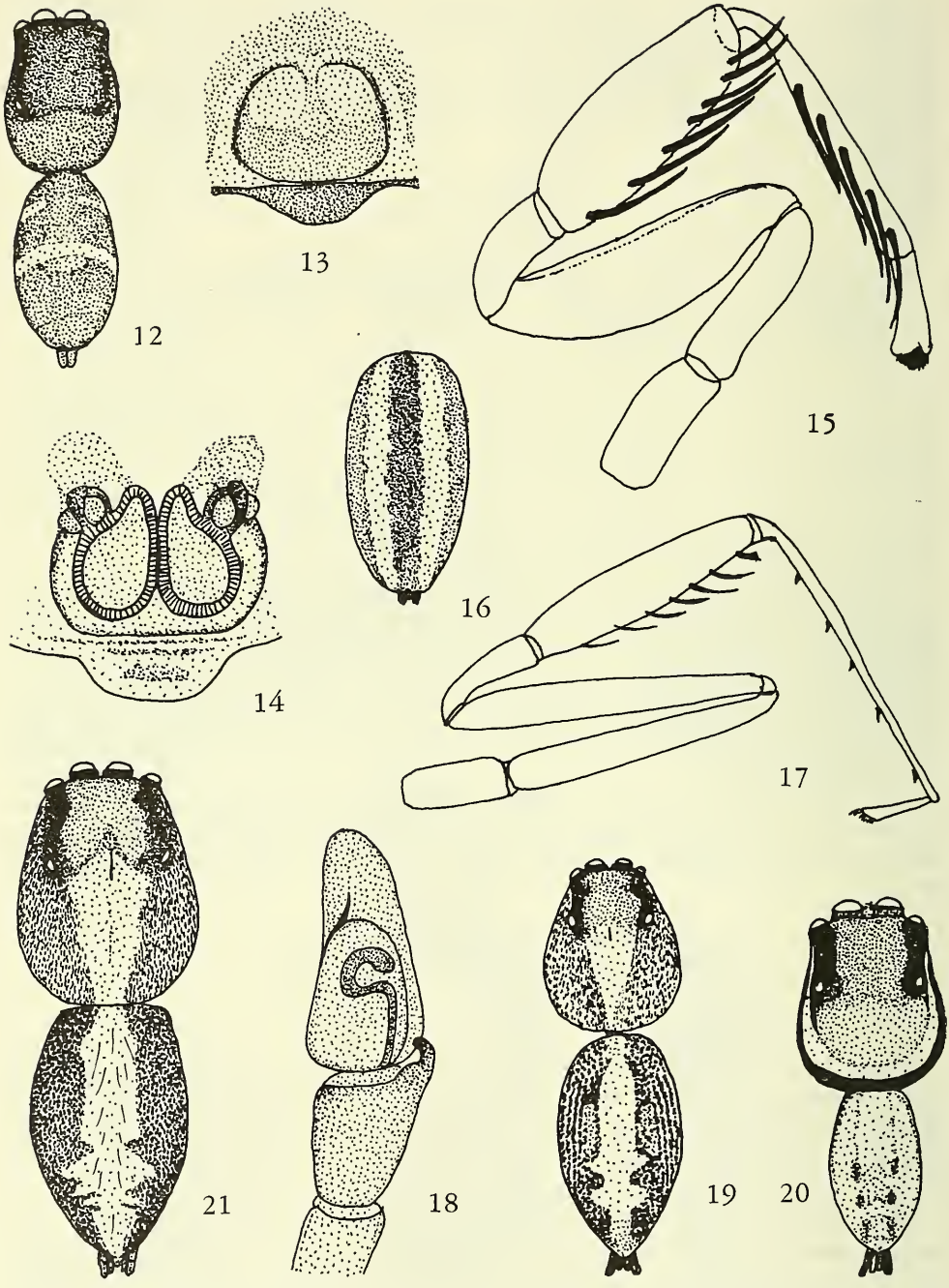

Fig. 12—18. *Diolenius amplectens* Thorell. 12, ♀; 13, id. epigyne; 14, id. vulva; 15, id. left I leg, lateral paraxial surface; 16, ♂, abdomen; 17, left I leg, lateral paraxial surface; 18, id. left palp, ventral view. Fig. 19, 20. *Cytaea frontaligera* (Thorell). 19, ♀; 20, ♂. Fig. 21. *C. nimbata* (Thorell), ♀. Fig. 12, 16, 20, 21: × 7; 13: × 70; 14: × 120; 15: × 20; 17: × 10; 18: × 40; 19: × 5

in order to show the strong spines — the same with the female leg). The palp (Fig. 18) strongly resembles that of *D. phrynoides* (Walckenaer, 1837); in that species, however, the spermal duct of the bulbus runs in a flat curve towards the tip. Measurements: cephalothorax, length 3.3 mm, width 2.6 mm; abdomen, length 4.2 mm, width 1.7 mm; legs, I 20, II 8, III 8, IV 10 mm. Some males are smaller, e.g. total body length 6 mm

FISSIDENTATI

Cytaeinae

Cytaea Keyserling, 1882

Cytaea frontaligera (Thorell, 1881)

Fig. 19, 20, 22—24

Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 607, ♀ ♂ (*Plexippus*).

Several females (8—11 mm) and three males (6—7 mm) from Merauke (1956—1957) belong to this species, known from the Aru Is. and Queensland (Roewer, 1954: 1025; Bonnet, 1956: 1371). They fully agree with Thorell's description and with the type material (Genoa Museum).

The central yellow band on the abdomen of the females may be much wider because the dark reddish brown squamiform hairs are easily rubbed off. The epigyne is somewhat variable: the distance between the two sperm canals may be greater and their strongly curved tips are not always discernible. In the male the pattern of the abdomen may be the same as in the female.

Cytaea nimbata (Thorell, 1881)

Fig. 21, 25—30

Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 600, ♂ (*Plexippus*).

A large number of *Cytaea* specimens (about 30 males and as many females from Mindiptana, 1958—1965; one ♂, one ♀ from Merauke, 1956—1957) belong to a second species.

Two *Cytaea* species resemble each other to a high degree, viz. *C. sinuata* (Doleschall, 1859) and *C. nimbata* Thorell, 1881 (cf. Thorell, loc. cit.). The Doleschall collection (Rijksmuseum van Natuurlijke Historie, Leiden) does not contain specimens of *Salticus sinuatus,* nor of *S. floricolus* Doleschall, 1859, a synonym of *sinuatus*. This species has a wide distribution: it is known from Sumatra and the Philippines to Australia (Roewer, 1954: 1025; Bonnet, 1956: 1372). Of *C. nimbata* only three males are known: two from Hatam in the Arfak Mountains, one from Andai, Vogelkop, all in New Guinea (type material, Genoa Museum) (Roewer, 1954: 1026; Bonnet, 1958: 3717 [*Plexippus*]).

I was able to compare my specimens with these types: the males are completely identical. Moreover, they possess one of the few characters given by Thorell, through which the *nimbata* male differs from the *sinuata* male. In *nimbata* the circular hollow of the bulbus with the spiral of the embolus occupies nearly 4/5 of the bulbus, whereas in *sinuata* in occupies scarcely more than half its width (loc. cit.: 603).

The body length of the males varies from 7—8 mm.

Female (Fig. 21). Cephalothorax: length 4.0 mm, width 3.4 mm; a broad black band containing the eyes surrounds a brown central field, the remaining part is yellowish brown but for the greater part it is covered with black, somewhat flattened

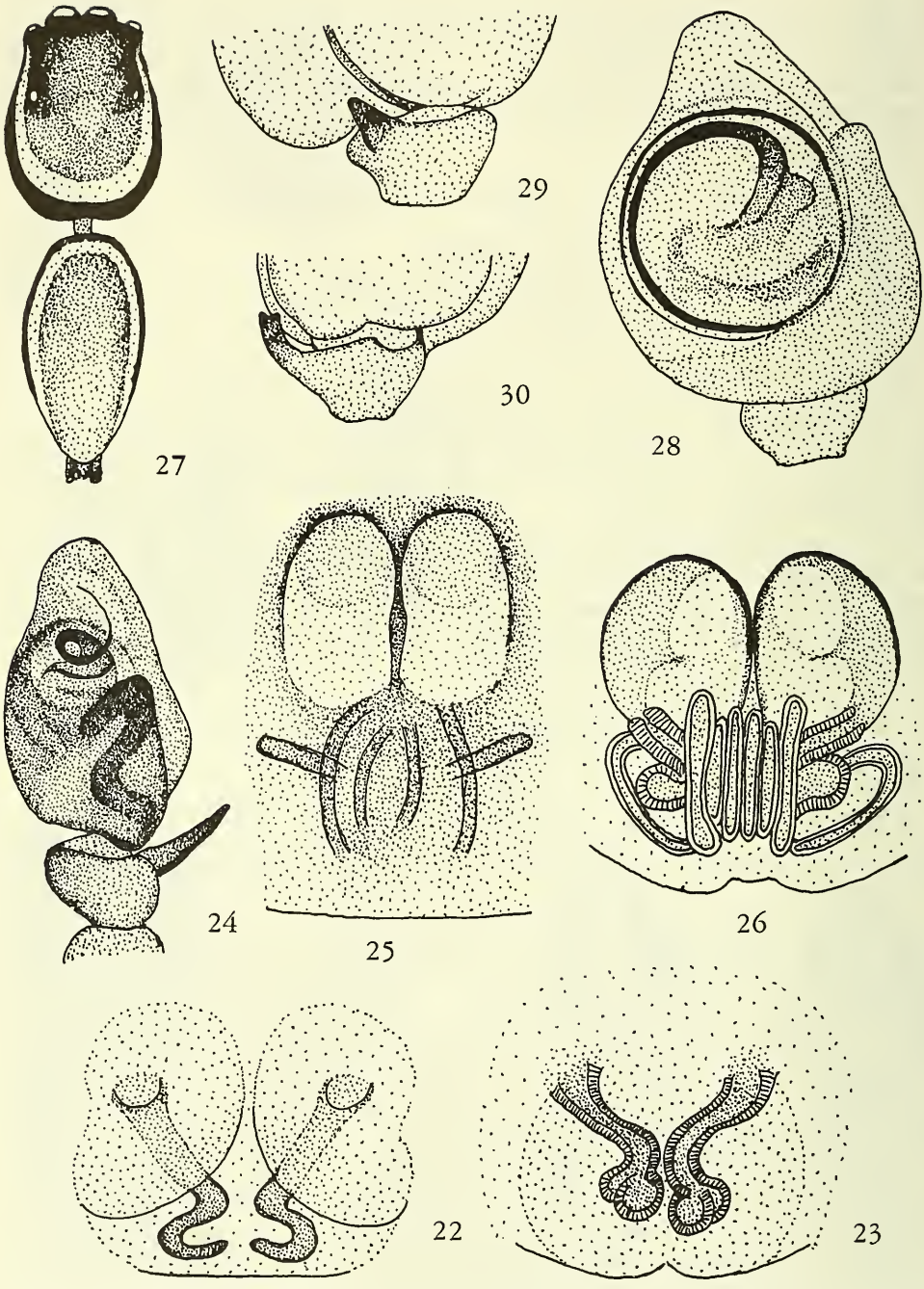

Fig. 22—24. *Cytaea frontaligera* (Thorell). 22, ♀, epigyne; 23, id. vulva; 24, ♂, left palp, ventral view. Fig. 25—30. *C. nimbata* (Thorell). 25, ♀, epigyne; 26, id. vulva; 27, ♂; 28, id. left palp, ventral view; 29, id. part of left palp, dorso-lateral view; 30, id. dorsal view. Fig. 22, 25: × 70; 23, 26: × 60; 24, 28—30: × 40; 27: × 7

hairs, which are easily rubbed off. Measurements of the legs: I 10.5, II 9.5, III 9.0, IV 8.5 mm.

Abdomen: length 4.5 mm, width 2.5 mm; yellow, covered with black squamiform hairs, except for the central band; these hairs, too, are easily loosened; underside greyish yellow; in some specimens, however, with a dark brown central band as in the male. Epigyne: Fig. 25, in darker specimens the details are not so clear as in our figure. Vulva: Fig. 26; the complexity of the sperm canals explains the fact that in the epigynes the visible part of these canals is not always the same. The body length varies from 9—11 mm.

Cytaea mitellata (Thorell, 1881)
Fig. 31, 32

Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 604, ♂ (*Plexippus*).

Thorell based his description on three males, one from Aru Is., one from Yule I. and one from Ternate. Three males in our collection (Mindiptana, 1958, 1965) are conform to the description and the type material (Genoa Museum); two of them are not so dark as in Fig. 31; their body length lays between 6 and 7 mm. There are no further records of this species (Roewer, 1954: 1026; Bonnet, 1958: 3717 [*Plexippus*]).

Euryattus Thorell, 1881
Euryattus bleekeri (Doleschall, 1859)
Fig. 33—36, 41, 42

Doleschall, 1859, Act. Soc. Sci. Ind.-Neerl. 5: 17, Pl. 3 Fig. 6, ♂ (*Salticus*).
Thorell, 1878, Ann. Mus. civ. stor. nat. Genova 13: 260, ♀ ♂ (*Plexippus*).
——, 1881, ibid. 17: 631, ♀ ♂ (*Plexippus*).
Keyserling, 1881, Arachn. Austr. 1 (2): 1299, Pl. 111 Fig. 1, ♀ (*Hasarius albescens*).
——, 1881, ibid.: 1300, Pl. 111 Fig. 2, ♀ (*H. pauperatus*).
——, 1881, ibid.: 1307, Pl. 111 Fig. 6, ♀ ♂ (*H. chrysostomus*) **syn. nov.**
Simon, 1903, Hist. nat. Araignées 2: 815, Fig. 962, ♂.

Doleschall's collection (Rijksmuseum van Natuurlijke Historie, Leiden) does not contain a specimen of his *Salticus bleekeri*. Therefore a comparison of some 30 *Euryattus* specimens, males and females, from Merauke (1956—1957) and Mindiptana (1958—1965) with the holotype was not possible; they fit rather well the short description and poor figure.

The specimens in our collection perfectly agree with Thorell's elaborate description of the male (1878: 260) and sufficiently with his much shorter description of the female (1878: 263, note). I studied the material discussed by him in his papers (Museo Civico di Storia Naturale, Genoa): in all details they are identical with my specimens.

Simon gave some characters of this species ("très commun à Amboine et en Nouvelle Guinée") and a figure of the characteristic dentation of the cheliceral furrow: our specimens agree with all of them. Moreover they are identical with some specimens in the Senckenberg Museum, Frankfurt a.M., identified by Strand, and with a pair from New Guinea in the Leiden Museum (det. probably Reimoser).

Variability. — Males. A rather broad band of white hairs is generally present along the borders of the cephalothorax and so is the band of yellow hairs along the abdomen; these hairs, however, may nearly totally have been rubbed off; the remaining part of the abdomen is uniform dark brown or bears some brownish yellow patches, sometimes

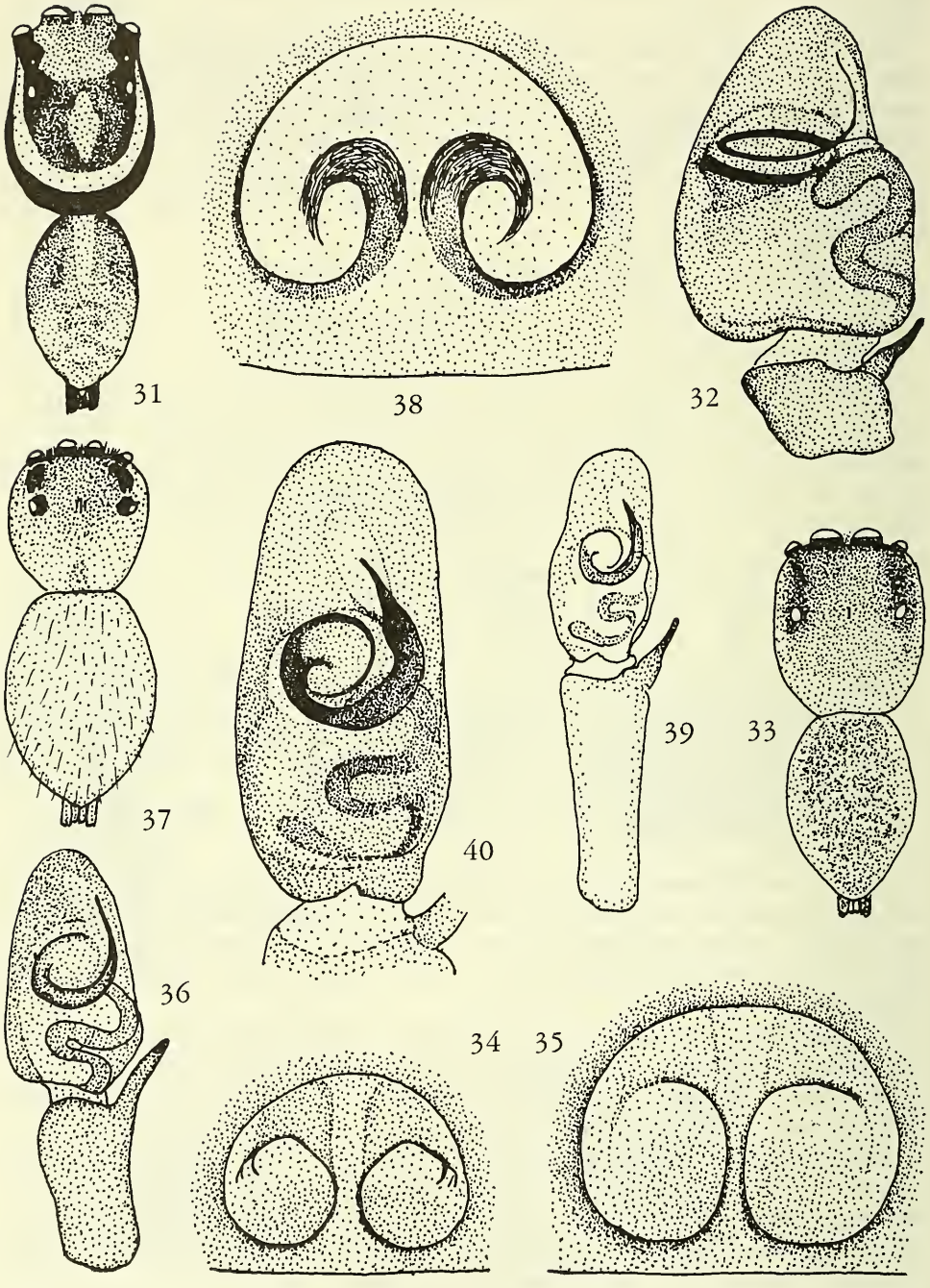

Fig. 31, 32. *Cytaea mitellata* (Thorell). 31, ♂; 32, id. left palp, ventral view. Fig. 33—36. *Euryattus bleekeri* (Doleschall). 33, ♀; 34, 35, id. epigyne; 36, ♂, left palp, ventral view. Fig. 37—40. *E. porcellus* Thorell. 37, ♀; 38, id. epigyne; 39, ♂, left palp, ventral view; 40, id. tarsal part. Fig. 31, 33: × 7; 32, 36, 40: × 40; 34, 35, 38: × 70; 37: × 3; 39: × 20

united into a wedge-shaped band on the posterior half. The legs are unicoloured brown or variegated with broad yellowish bands.

The variability of the dimensions is remarkable: the six males from Merauke measure 5.5, 7 (3 ex.), 7.5 and 8.5 mm; the ten males from Mindiptana: 6, 7, 7.5, 8 (2 ex.), 9, 9.5 (2 ex.) and 10 (2 ex.) mm. Thorell (1881: 631) says: "Long. 4.5—9 mm". The palpi of the large specimens are somewhat longer than those of the smaller: tibia 0.68 (0.59) mm, tarsus 0.81 (0.68) mm; bulbus and tibial apophyse are exactly the same, only slightly larger.

Females. Colour as in the males. The two females from Merauke measure 6 and 7 mm; of the ten females from Mindiptana one is 8 mm, the others are from 9.5—10.5 mm. The epigyne and the vulva of the small Merauke specimens (Fig. 34, 41) are smaller than those of the large Mindiptana specimens (Fig. 35, 42); the structure, however, is the same in both. The sidewards curved furrows in the epigyne are not always as sharply marked as in our figures, the straight furrows are often rather vague; in the female described by Thorell (Genoa Museum) they are very near to each other and form a triangle with the anterior border of the epigyne (1878: 264).

Synonymy. — Simon (1903: 815, nota 3) remarked about *E. bleekeri:* "Les *Hasarius albescens* [♀], *pauperatus* (♀) et *pumilo* [sic!] (♂) Keys. en sont peut-être synonymes". Roewer (1954: 1026) and Bonnet (1956: 1816, 1817) followed him as to *pauperatus* and *pumilio,* but retained *albescens* as a good species.

A comparison of our specimens with the descriptions, figures and type specimens (Hamburg Museum) of *H. albescens* from Rockhampton (Queensland) and *H. pauperatus* from Port Mackay (Queensland) have convinced me that both are synonyms of *bleekeri.* Keyserling's Fig. 1a of epigyne of *albescens* suggests a pointed anterior border; in the type, however, this border is regularly curved as in our Fig. 35 of *bleekeri*; the epigyne of *pauperatus* is identical with this figure. The abdomens of both type specimens are in rather bad condition and do not give further indications.

H. pumilio Keyserling (Arachn. Austral. 1 (2) [1881]: 1317, Pl. 112 Fig. 3) from Peak Downs (Queensland), holotype in the Hamburg Museum, belongs without any doubt to a different species and almost certainly to a different genus: e.g., the palp resembles that of *Dendryphantes laticeps* Strand (Fig. 87).

In his discussion of the genus *Plotius,* near to *Euryattus,* Simon (1903: 818) wrote: "j'en connais deux espèces: *P. curtus* E. Sim. de l'île Halmahera et *breviusculus* E. Sim. de Ceylon, et je lui rapporte le *Hasarius chrysostomus* Keys. du Queensland". He certainly did not see the male types of this species (three specimens, Hamburg Museum — the female is lost): they do not possess the characters of *Plotius* but clearly those of *Euryattus,* e.g. the characteristic dentation of the cheliceral furrow (Simon, loc. cit.: 812, Fig. 962); the male palp is almost identical with that of *Euryattus senex* (Simon, loc. cit.: 812, Fig. 961).

After having studied Keyserling's description and figures of *H. chrysostomus* and the male types from Rockhampton I am certain that also this species is a synonym of *E. bleekeri.*

The type locality of *bleekeri* is Amboina; its area extends from that island to Australia (Roewer, 1954: 1026; Bonnet, 1956: 1817).

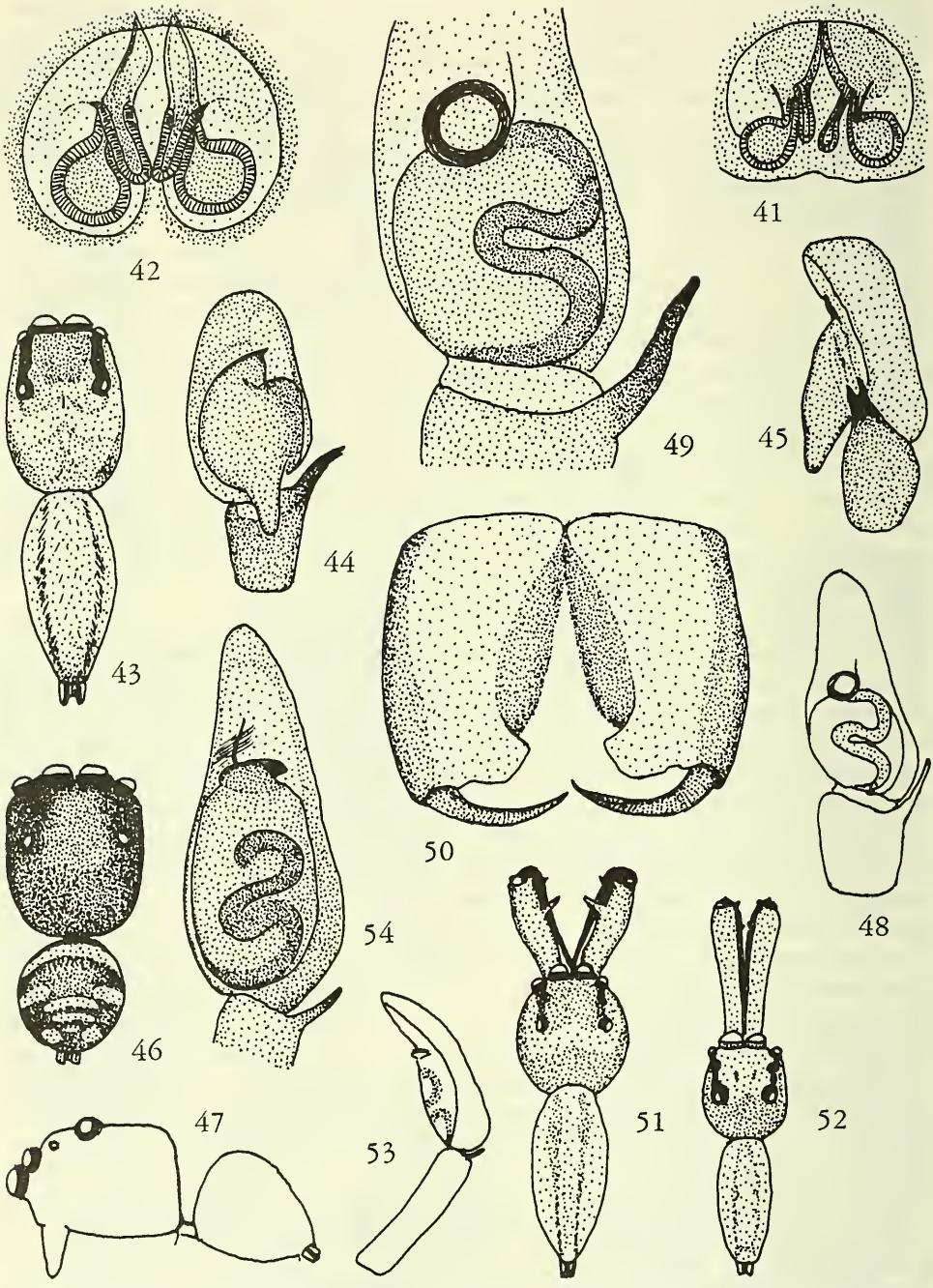

Fig. 41, 42. *Euryattus bleekeri* (Doleschall), ♀, vulva. Fig. 43—45. *Trite longula* (Thorell). 43, ♂; 44, id. left palp, ventral view; 45, id. left palp, lateral view. Fig. 46—50. *Sandalodes bernsteini* Thorell. 46, ♂; 47, id. lateral view; 48, 49, id. left palp, ventral view; 50, id. chelicerae, frontal view. Fig. 51. *Bathippus macrognathus* (Thorell), ♂. Fig. 52—54. *B. papuanus* Thorell. 52, ♂; 53, id. left palp, lateral view; 54, id. ventral view. Fig. 41, 42: × 60; 43, 46, 47: × 7; 44, 45, 48, 54: × 40; 49: × 110; 50: × 35; 51, 52: × 3; 53: × 20

Euryattus porcellus Thorell, 1881
Fig. 37—40

Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 660, ♀ ♂.
Simon, 1903, Hist. nat. Araignées 2: 813, Fig. 959, ♀ ♂.

A female (14 mm) and a male (13 mm) from Merauke (1956—1957) fully agree with Thorell's description and his type material in the Museo Civico di Storia Naturale, Genoa.

The type locality is Yule I., and the species has been found on New Guinea only (Roewer, 1954: 1027; Bonnet, 1956: 1817).

Trite Simon, 1885
Trite longula (Thorell, 1881)
Fig. 43—45

Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 454, ♂ (*Marptusa*).

A male of this species (7 mm) from Merauke (1956—1957) is in all details identical with the holotype from Cape York, North Australia (Genoa Museum); the species was also recorded from Lord Howe I. (Rainbow, *Rec. S. Austr. Mus.* 1 [1920]: 267).

UNIDENTATI

Hyllinae

Sandalodes Keyserling, 1883
Sandalodes bernsteini (Thorell, 1881)
Fig. 46—50

Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 619, ♂ (*Plexippus*).

The description of this species was based on three males, two from Andai (Vogelkop, New Guinea) and one from the Aru Is.; it had not been found since and the female is still unknown (Roewer, 1954: 1067; Bonnet, 1957: 2246 [*Hyllus*]). A male (5 mm) from Mindiptana (1958) is conform to the description and the types in the Genoa Museum.

Plexippinae

Bathippus Thorell, 1892
Bathippus macrognathus (Thorell, 1881)
Fig. 51, 55

Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 531, ♂ (*Plexippus*).

Six males (8—10 mm) from Merauke (1956—1957) correspond with Thorell's description and his type material from Fly River (South New Guinea) and the Aru Is. (Genoa Museum); the species was also collected on the Kei Is. (Roewer, 1954: 1076; Bonnet, 1955: 854). The female is still unknown but it may have been described as a separate species, probably even in another genus.

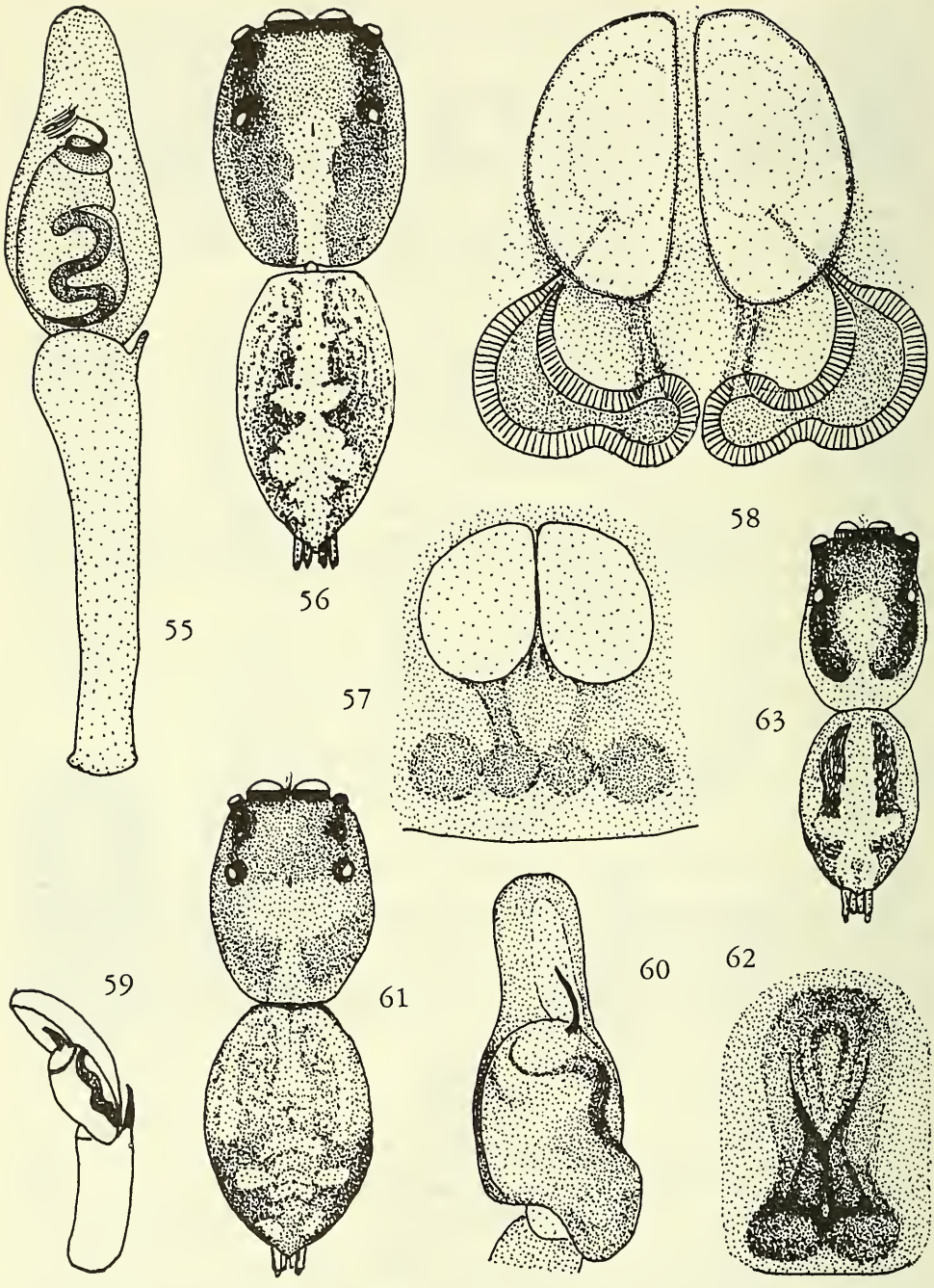

Fig. 55. *Bathippus macrognathus* (Thorell), ♂, left palp, ventral view. Fig. 56—60. *Palpelius beccarii* (Thorell). 56, ♀; 57, id. epigyne; 58, id. vulva; 59, ♂, left palp, ventro-lateral view; 60, id. ventral view. Fig. 61—63. *Plexippus paykullii* (Audouin). 61, ♀; 62, id. epigyne; 63, ♂. Fig. 55, 60: × 40; 56, 61, 63: × 7; 57: × 70; 58: × 120; 59: × 20; 62: × 35

Bathippus papuanus (Thorell, 1881)
Fig. 52—54

Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 526, ♀ ♂ (*Plexippus monstrouzieri* Lucas var. *papuana*).
Roewer, 1938, Mém. Mus. Hist. nat. Belg. (hors série) 3 (19): 87, Fig. 67—69, ♂.

According to Simon (1903, Hist. nat. Araignées 2: 731) Thorell's var. *papuana* differs from *monstrouzieri* Lucas, 1869. The type material (several males, one female, Genoa Museum) originated from the Aru Is. and Fly River; the species has also been recorded from Manoi (Solomon Is.); the type locality of *monstrouzieri* is New Caledonia (Roewer, 1954: 1077; Bonnet, 1955: 855).

One male (9 mm) from Mindiptana (1965) is in agreement with Thorell's description and type material, and with the figures given by Roewer.

Palpelius Simon, 1903

Palpelius beccarii (Thorell, 1881)
Fig. 56—60

Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 582, ♀ ♂ (*Plexippus*).
——, 1881, ibid.: 588, ♀ (*P. dearmatus*) syn. nov.
Simon, 1903, Hist. nat. Araignées 2: 735, Fig. 842, ♂.

Thorell described two closely related species, viz. *Plexippus beccarii* and *P. dearmatus*: the first species, several males and a few females, from Ternate, Ceram, New Guinea (Andai, Ramoi and Fly River), Yule I., Aru Is. and Somerset (Cape York, Australia); the second species, some females only, from Yule I., Aru Is. and Somerset. His description of *dearmatus* is very short; apart from a few colour differences he saw small differences in the epigyne only: (1) in *dearmatus* the two egg-shaped parts are united over nearly their whole length, in *beccarii* they do not touch each other or do so along the anterior half only, (2) in *dearmatus* the width of the receptacula is about 1.5 times that of the egg-shaped parts, whereas in *beccarii* the width of both is equal. About *dearmatus*, however, he remarked: "vix modo varietas est *P. beccarii*" (it is scarcely a variety of *P. beccarii*).

Our collection contains three females from Merauke (1956—1957), four from Mindiptana (1958, 1965) (10—11 mm) and three males (8—9 mm) from Mindiptana (1958, 1965). I could compare them with type specimens in the Museo Civico di Storia Naturale, Genoa. The males are identical with the *beccarii* males. As to the females: the egg-shaped parts of the epigyne are as in *dearmatus,* or as in *beccarii* or they may show features of both (cf. Fig. 57, 58); the width of the receptacula varies from 1.1 to 1.5 times the width of the egg-shaped parts; the females from Merauke do not differ from those from Mindiptana. *P. dearmatus*, therefore, must be considered a synonym of *beccarii*.

The species has not been found outside the region mentioned above (Roewer, 1954: 1084; Bonnet, 1958: 3303).

Plexippus C. L. Koch, 1846

Plexippus paykullii (Audouin, 1827)
Fig. 61—65

Audouin, 1827, Explic. Planch. Arachn. Savigny Descr. Egypt. (2) 22: 409, Pl. 7 Fig. 22, ♂ (*Attus*).
Doleschall, 1859, Act. Soc. Sci. Ind.-Neerl. 5: 14, Pl. 9 Fig. 5, ♀ (*Salticus culicivorus*).

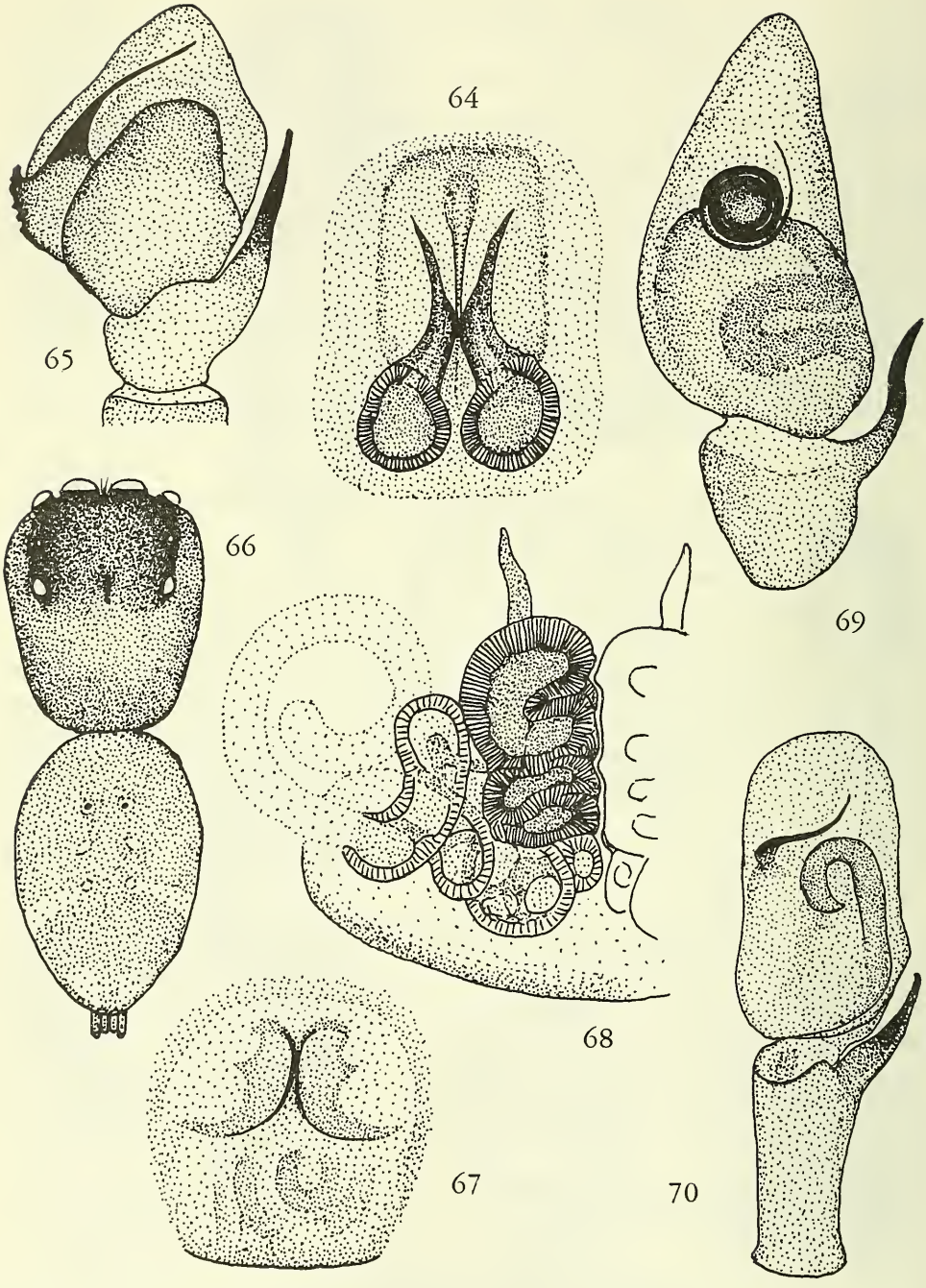

Fig. 64, 65. *Plexippus paykullii* (Audouin). 64, ♀, vulva; 65, ♂, left palp, ventral view. Fig. 66—69. *Zenodorus durvillii* (Walckenaer). 66, ♀; 67, id. epigyne; 68, id. vulva; 69, ♂, left palp, ventral view. Fig. 70. *Mopsus mormon* Karsch, ♂, left palp, ventral view. Fig. 64: × 50; 65, 69, 70: × 40; 66: × 7; 67: × 55; 68: × 120

Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 501, ♀ ♂ (*Menemerus*).
Simon, 1903, Hist. nat. Araignées 2: 711, 734, Fig. 839—841, ♀ ♂.
——, 1937, Arachn. France 6 (5): 1242, 1271, Fig. 2023, 2024, ♀ ♂.

As this species is nearly cosmopolite there are many more useful descriptions and figures (cf. Roewer, 1954: 1086; Bonnet, 1958: 3717). Doleschall's collection does not contain the type of his *Salticus culicivorus*.

The epigyne is somewhat variable: when the skin is lightly sclerotized the whole vulva (Fig. 64) is discernible, when it is heavily sclerotized the epigyne consists of a dark brown shield without details; usually the vulva is more or less discernible.

Our collection contains several males (6—9 mm) and females (8—10 mm) from Merauke (1956—1957) and Mindiptana (1958—1965).

Zenodorus Peckham, 1886
Zenodorus durvillii (Walckenaer, 1937)
Fig. 66—69

Walckenaer, 1837, Hist. natur. Ins. Apt. 1: 459, ♂ (*Attus*).
Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 653, ♀ ♂ (*Ephippus*).
Keyserling, 1883, Arachn. Austral. 1 (2): 1422, Pl. 120 Fig. 4, 5, ♀ ♂ (*Ephippus*).

Squamiform hairs with a pink gloss, scattered over cephalothorax and abdomen, render *durvillii* a beautiful species. It is known from New Guinea and adjacent islands and from Australia (Roewer, 1954: 1108; Bonnet, 1959: 4960), and it is common in the environs of Merauke and Mindiptana: many females (9—11 mm) and males (7—10 mm).

Thyeninae

Mopsus Karsch, 1878
Mopsus mormon Karsch, 1878
Fig. 70—74

Karsch, 1878, Mitt. Münchn. Entom. Ver. 2: 31, ♂.
Thorell, 1881, Ann. Mus. civ. stor. nat. Genova 17: 462, ♀ ♂.
Simon, 1903, Hist. nat. Araignées 2: 686, Fig. 816—818, ♀ ♂.

In his "Katalog der Araneae" Roewer suggested that the male only was described (1954: 1109) though he mentioned Simon, who gave a description of the female and added: "très répandue en Nouvelle Guinée et dans le Nord de l'Australie" (1903: 686). There are many females (12—15 mm) and males (12—15 mm) in my collection, all from Merauke (1956—1957), only one male from Mindiptana (1965).

The species was recorded from several places in New Guinea, adjacent islands and Cape York (Australia) (Thorell, loc. cit.: 466; Roewer, 1954: 1109; Bonnet, 1957: 2985). In Queensland and New South Wales the closely related *M. penicillatus* (Karsch, 1878) is found.

Strongly contrasting with the female, where the cephalothorax is brownish yellow and the abdomen is yellowish white, the male is beautifully coloured: the abdomen is yellowish white with two black longitudinal stripes like in the female (Strand [1911, *Abh. senckenb. naturf. Ges.* 34: 185] remarked that in living specimens the abdomen is green). The cephalothorax is orange, eye region lively red, frontal part of the cephalothorax, chelicerae and underside of the stout first legs dark wine-red, the femora

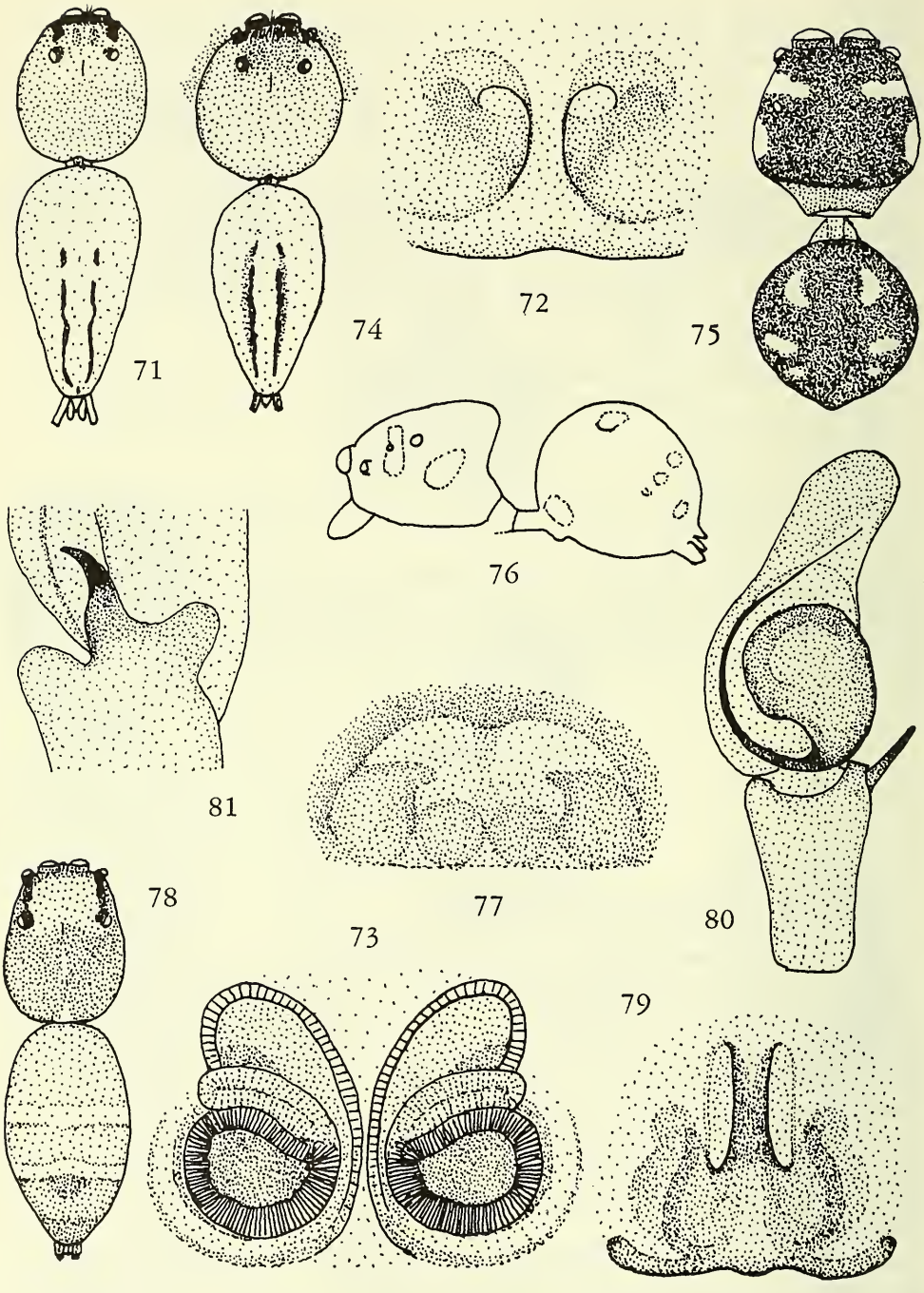

Fig. 71—74. *Mopsus mormon* Karsch. 71, ♀; 72, id. epigyne; 73, id. vulva; 74, ♂. Fig. 75—77. *Poecilorchestes decoratus* Simon. 75, ♀; 76, id. lateral view; 77, id. epigyne. Fig. 78—81. *Cosmophasis bitaeniata* (Keyserling). 78, ♀; 79, id. epigyne; 80, ♂, left palp, ventral view; 81, id. tibial apophyses, lateral view. Fig. 71, 74: × 3; 72, 79, 81: × 70; 73: × 120; 75, 76: × 14; 77: × 150; 78: × 7; 80: × 40

with some squamiform white hairs, the tips of the chelicerae and the greater part of the first legs orange; the anterior median eyes have a greenish lustre. A rather broad fringe of snow-white hairs extends from the lateral eyes to about the middle of the cephalothorax, whereas long black hairs form a tuft between the anterior lateral eyes.

Coccorchestinae

Poecilorchestes Simon, 1901
Poecilorchestes decoratus Simon, 1901
Fig. 75—77

Simon, 1901, Hist. nat. Araignées 2: 648, Fig. 765—767, ♂.
——, 1902, Ann. Soc. entom. Belg. 46: 34, ♂.

A comparison of a female of this family (Mindiptana, 1965) with the description and figures given by Simon and with the male type from Dorey (=Manokwari, North New Guinea) in the Muséum national d'Histoire naturelle, Paris, have convinced me that it belongs to the same species. The remarkable shape of the cephalothorax, the position of the eyes and of the striking snow-white patches on cephalothorax, abdomen and legs, caused by squamiform hairs, the very rugose skin of the cephalothorax: all these characters are common to both; the colour only is somewhat different: the male is dark reddish brown, in the female there is a purplish hue over the dark brown colour.

The measurements of the female are: cephalothorax, length 1.7 mm, width 1.6 mm; abdomen, length 1.9 mm, width 1.6 mm; legs. I 2.5, II 2.3, III 2.1, IV 2.6 mm. Epigyne: Fig. 77.

Heliophaninae

Cosmophasis Simon, 1901
Cosmophasis bitaeniata (Keyserling, 1882)
Fig. 78—81

Keyserling, 1882, Arachn. Austral. 1 (2): 1365, Pl. 115 Fig. 8, ♂ (*Sobara*).
——, 1882, ibid.: 1374, Pl. 116 Fig. 5, ♀ (*Selaophora rubra*).

My collection contains a couple of this beautifully orange-coloured species (Merauke, 1956—1957); the male (8 mm) is identical with the holotype of *Sobara bitaeniata* from the environs of Sydney (Hamburg Museum). The female paratype is juvenile ("Das leider unentwickelte Weib"); in his description Keyserling mentions Tafel 115 Fig. 9 "femina, Cephalothorax", but there is no Fig. 9 on this plate. The holotype of *Selaophora rubra* from Cape York is lost; the female in my collection (7 mm) fully agrees with Keyserling's description and figures. The species is also known from the Aru Is. (Roewer, 1954: 1152; Bonnet, 1956: 1241).

Strand (*Abh. senckenb. naturf. Ges.* 34 [1911]: 180, Pl. 4 Fig. 22, Pl. 6 Fig. 84) described *C. orsimoides* from the Kei Is.; the female holotype (SMF 2436) is smaller than *C. bitaeniata,* viz., 5 mm; it seems to me, however, that the epigynes are identical; a study of the vulvae, which are only partly discernible through the skin, could give certainty. The male of *orsimoides* is unknown.

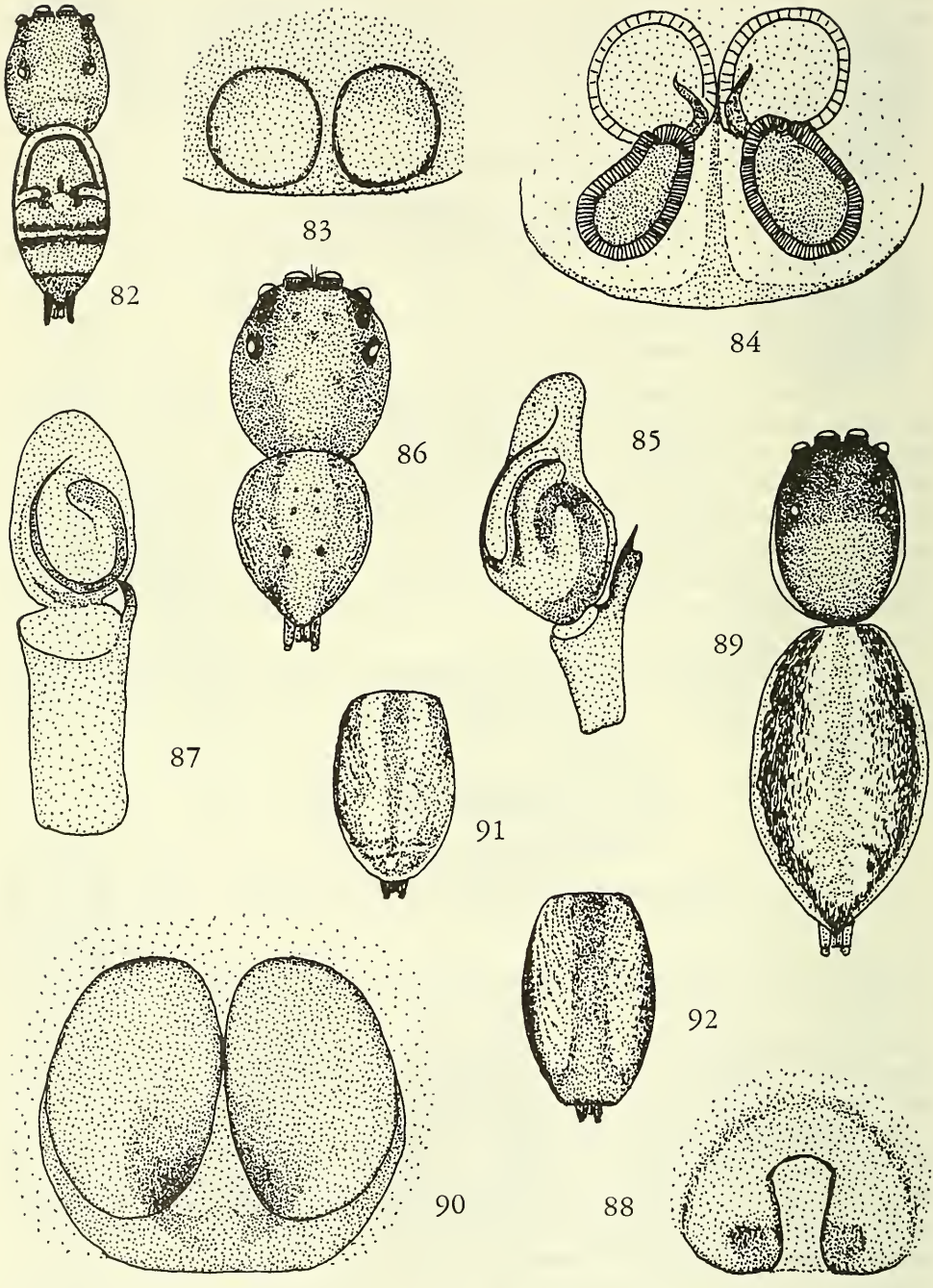

Fig. 82—85. *Cosmophasis micarioides* (L. Koch). 82, ♀; 83, id. epigyne; 84, id. vulva; 85, ♂, left palp, ventral view. Fig. 86—88. *Dendryphantes laticeps* Strand. 86, ♂; 87, id. left palp, ventral view; 88, ♀, epigyne. Fig. 89—92. *Menemerus bivittatus* (Dufour). 89, ♀; 90, id. epigyne; 91, 92, ♂, abdomen. Fig. 82, 86, 89, 91, 92: × 7; 83: × 150; 84: × 120; 85, 87: × 40; 88, 90: × 70

Cosmophasis micarioides (L. Koch, 1880)
Fig. 82—85

L. Koch, 1880, Arachn. Austral. 1 (2): 1178, Pl. 102 Fig. 3, ♂ (*Amycus*).
Strand, 1911, Abh. senckenb. naturf. Ges. 34: 180, Pl. 4 Fig. 16, Pl. 6 Fig. 85, ♀.

There is a large series of females (5—7 mm) and males (5—7 mm) in my collection from Merauke (1956—1957) and Mindiptana (1958—1965); the males agree with Koch's description and figures and with the male holotype in the Zoologisches Museum, Hamburg; the females are identical with several females, identified by Strand, in the Senckenberg Museum, Frankfurt a.M.

The colour of the female is rather variable: it may be multicoloured, viz., orange, yellow, black and silver-coloured, sometimes these colours have partly faded away, or even the greater part of the coloured squamiform hairs are rubbed off, resulting in an almost uniform tawny colour of the abdomen.

Koch's figure of the male does not give a good idea of its colour-pattern: the contrast between the dark and the lighter parts is much too strong. In reality there is only a faint silver-coloured bloom in the middle and on the sides of the dark greyish brown abdomen and some greenish and purplish metallic lustre on the cephalothorax. The colours may for the greater part, have disappeared, as in the female.

Strand's *C. maculiventris* (*Abh. senckenb. naturf. Ges.* 34 [1911]: 180, Pl. 4 Fig. 23 — SMF 2433) from Terangan, Aru Is., is almost certainly a synonym of *micarioides:* (1) colours and pattern are the same, (2) the characteristic light spots on the underside of the abdomen are discernible in nearly all specimens of our collection, especially in the vividly coloured ones, (3) the not yet completely developed epigyne ("Die nicht reife Epigyne erscheint in Flüssigkeit als ein weisslicher, vorn gerundeter Querfleck, der mehr als doppelt so breit wie lang ist und durch eine schwarze Mittellängslinie geteilt zu sein scheint") fits very well the developed form.

The type locality of *micarioides* is Port Mackay (Queensland) and the species has also been recorded from other parts of Australia, from New Guinea and adjacent islands (Roewer, 1954: 1153; Bonnet, 1956: 1243).

Dendryphantinae

Dendryphantes C. L. Koch, 1837
Dendryphantes laticeps Strand, 1911
Fig. 86—88

Strand, 1911, Abh. senckenb. naturf. Ges. 34: 183, Pl. 4 Fig. 25, Pl. 6 Fig. 91, ♂.

Two males (7 and 8 mm) from Merauke, 1956—1957, fully correspond with Strand's description and figures and with the holotype from Terangan, Aru Is. (SMF 2452). The species is also known from the Kei Is. (Roewer, 1954: 1190; Bonnet, 1956: 1396); the female, however, had not yet been found.

A female, also from Merauke, certainly belongs to the same species. In nearly all details it is identical with one of the two males (Fig. 86): cephalothorax and all appendices are dark wine-red, palpi and first legs are flattened, the sternum bears a blunt knob, the abdomen is flattened and the sides are wrinkled. The colour of the abdomen is lighter, but in this respect the female rather resembles the other male, where all colours are lighter. Measurements of the female: cephalothorax, length 2.7 mm, width

2.4 mm; abdomen, length 4.0 mm, width 2.5 mm; legs I 5.6, II 4.3, III 3.5, IV 4.5 mm. Epigyne: Fig. 88.

Marpissinae

Menemerus Simon, 1868

Menemerus bivittatus (Dufour, 1831)

Fig. 89—95

Dufour, 1831, Ann. Sci. nat. 22: 369, Pl. 11 Fig. 5, ♀ (*Salticus*).
Doleschall, 1859, Act. Soc. Sci. Ind.-Neerl. 5: 15, Pl. 9 Fig. 4, ♀ (*Salticus convergens*).
Thorell, 1878, Ann. Mus. civ. stor. nat. Genova 13: 232, ♀ ♂ (*Icius convergens*).
F. Pickard-Cambridge, 1901, Arachnida *in* Biol. Centr. Amer. Zool.: 250, Pl. 21 Fig. 18, 19, ♀ ♂ (*Marpissa melanognatha*).
Simon, 1937, Arachn. France 6 (5): 1210, 1262, Fig. 1932, 1933, ♀ ♂.
Berland & Millot, 1941, Mém. Mus. Hist. nat. Paris 12: 246, Fig. 49, 50 A-C, ♀ ♂.

There is a long list of synonyms and there exist several other useful descriptions and figures of this nearly cosmopolite species (cf. Roewer, 1954: 1263; Bonnet, 1957: 2767).

In our collection there are some 20 females (8—10 mm) and four males (6—8 mm) from Merauke (1956—1957) and Mindiptana (1959, 1965). In the female the pattern of the abdomen is often less distinct than in our Fig. 89: the dark brown hairs are easily rubbed off. As the epigyne is surrounded by many hairs and sometimes partly filled with a resinous concretion ("Begattungszeichen"), its shape may be not as clear as in our Fig. 90. In the abdomen of the male the lateral streaks are lighter than in the female, whereas the central streak is darker (Fig. 91, 92). The bulbus of the male palp may be smooth or with a more or less deep groove (Fig. 94, 95; cf. Pickard-Cambridge, loc. cit. and Berland & Millot, loc. cit.).

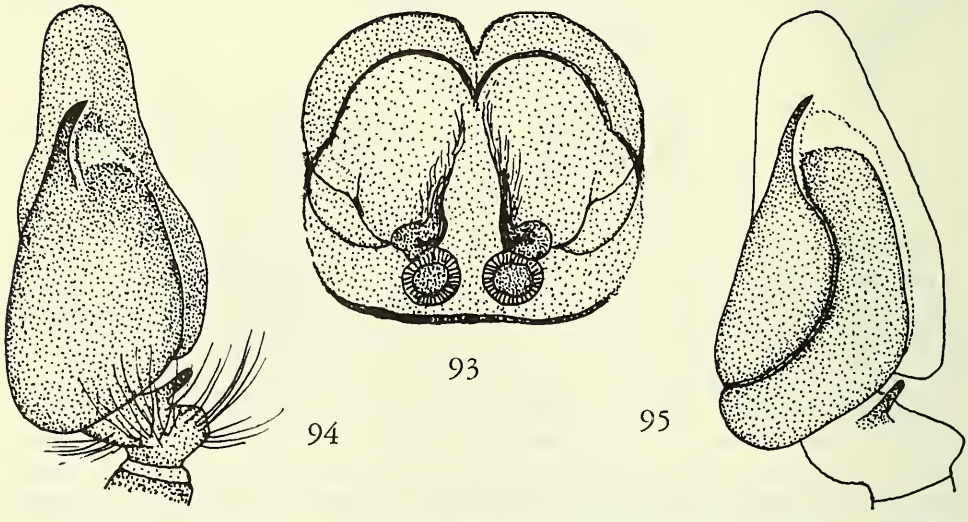

Fig. 93—95. *Menemerus bivittatus* (Dufour). 93, ♀, vulva (× 60); 94, 95, ♂, left palp, ventral view (× 40)

Concluding remarks

The collection made by Br. Monulf in the environs of Merauke (1956—1957) and Mindiptana (1958—1965) contains about 200 species. In the present series of papers (Chrysanthus, 1958—1968) 151 species are dealt with; 110 are known species, 41 are described as new to science of Arachnology. Of 19 species I could describe the male, hitherto unknown, of 6 species I could give a description of the unknown female. At least 15 species were not yet recorded from New Guinea; 21 species were recorded for the first time after their original descriptions, these descriptions being published 50, or even 80 years ago. This fact is not so surprising because after the publications by Kulczynski, Strand and Hogg, all between 1911 and 1915, scarcely any collecting, followed by publications, occurred in New Guinea: I, therefore, do not agree with Bonnet (1961: 438) who seems to doubt the validity of species, described from a single specimen so many years ago, if no specimens have been found since.

About 50 species of the collection have not yet been discussed: part of them have been obtained after my publication of the study of their group, the others need further investigation. I hope to include them in a new series of papers on New Guinean Spiders, dealing with material from other collections.

LIST OF SPECIES

discussed in "Spiders from South New Guinea", I—X

The signs ♀n, ♂n denote first description of female or male, respectively;
NG, means first records for New Guinea;
Ch., means Chrysanthus, referring to the papers listed under References, below.

ECRIBELLATAE

SICARIIDAE

Scytodes fusca Walckenaer, 1837. Ch., 1967b: 91, ♀ ♂
S. longipes Lucas, 1845. Ch., 1967b: 89, ♀ ♂
S. pallida Doleschall, 1859. Ch., 1967b: 91, ♀, **NG**
S. tardigrada Thorell, 1881. Ch., 1967b: 91, ♀, **NG**

PHOLCIDAE

Artema atlanta Walckenaer, 1837. Ch., 1967b: 92, ♀ ♂
Crossopriza lyoni (Blackwall, 1867). Ch., 1967b: 96, ♀ ♂, **NG**
Psilochorus nigromaculatus Kulczynski, 1911. Ch., 1967b: 96, ♀n (second record)

ZODARIIDAE

Storena zebra Thorell, 1881. Ch., 1967b: 98, ♂

THERIDIIDAE

Achaeranea decorata (L. Koch, 1867). Ch., 1963: 743, ♀, **NG**
A. hammeni Chrysanthus, 1963. Ch., 1963: 746, ♀
A. krausi Chrysanthus, 1963. Ch., 1963: 744, ♀ ♂
A. meraukensis Chrysanthus, 1963. Ch., 1963: 746, ♀ ♂
A. mundula (L. Koch, 1872) *papuana* Chrysanthus, 1963. Ch., 1963: 741, ♀
Argyrodes argentatus Cambridge, 1880. Ch., 1963: 739, ♀
A. fissifrons Cambridge, 1869. Ch., 1963: 737, ♂
A. flavescens Cambridge, 1880. Ch., 1963: 739, ♀ ♂
A. kulczynskii Roewer, 1942 (= *A. argenteolus* Kulczynski, 1911). Ch., 1963: 741, ♀ ♂n (second record)
A. miniaceus (Doleschall, 1857). Ch., 1963: 739, ♀ ♂
Latrodectus geometricus C. L. Koch, 1841. Ch., 1963: 737, ♀
Lithyphantes bertkaui (Thorell, 1881). Ch., 1963: 737, ♀ ♂n (second record)
Phoroncidia levii Chrysanthus, 1963. Ch., 1963: 735, ♀
Theridion diadematum Chrysanthus, 1963. Ch., 1963: 749, ♀
T. rufipes Lucas, 1846. Ch., 1963: 748, ♀ ♂

ARGYOPIDAE

Anepsion wichmanni (Kulczynski, 1911). Ch., 1961: 207, ♀ ♂ n (second record)
Arachnura melanura Simon, 1867. Ch., 1961: 203, ♀, **NG**
Araneus cyrtarachnoides (Keyserling, 1887). Ch., 1960: 36, ♀ ♂
A. dehaani (Doleschall, 1859). Ch., 1960: 31, ♀
A. granti Hogg, 1914. Ch., 1960: 36, ♀ ♂ n (second record)
A. inustus (L. Koch, 1871). Ch., 1960: 41, ♀ ♂ n, **NG**
A. laglaizei (Simon, 1877). Ch., 1960: 39, ♀
A. lugubris (Walckenaer, 1842). Ch., 1960: 36, ♀ ♂
A. rufofemoratus (Simon, 1884). Ch., 1960: 33, ♀ ♂
A. simillimus Kulczynski, 1911. Ch., 1961: 199, ♀
A. theisi (Walckenaer, 1842). Ch., 1960: 39, ♀ ♂
A. transmarinus (Keyserling, 1865) (= *productus* L. Koch, 1867). Ch., 1960: 30, ♀ ♂
Argyope aetherea (Walckenaer, 1842). Ch., 1958: 237, 242, ♀ ♂ n
A. catenulata (Doleschall, 1859). Ch., 1958: 240, ♀ ♂
A. chloreides Chrysanthus, 1961. Ch., 1961: 197, ♀
A. mindiptanensis Chrysanthus, 1961. Ch., 1961: 195, ♀
A. picta L. Koch, 1871. Ch., 1958: 237, 242, ♀ ♂
Carepalxis tricuspidata Chrysanthus, 1961. Ch., 1961: 205, ♀
Cyclosa camelodes (Thorell, 1878). Ch., 1961: 201, ♀
C. insulana (Costa, 1834). Ch., 1961: 199, ♀ ♂
C. micula (Thorell, 1892). Ch., 1961: 203, ♀
C. mulmeinensis (Thorell, 1887). Ch., 1961: 203, ♀
C. velata Chrysanthus, 1961. Ch., 1961: 201, ♀ ♂
Cyrtarachne friederici Strand, 1911. Ch., 1961: 209, ♀
C. tricolor (Doleschall, 1859). Ch., 1961: 209, ♀
Cyrtophora beccarii (Thorell, 1878). Ch., 1960: 25, ♀ ♂
C. cicatrosa (Stoliczka, 1869). Ch., 1960: 28, ♀ ♂ n
C. cylindroides (Walckenaer, 1842). Ch., 1959: 200; 1960: 25, ♀ ♂
C. moluccensis (Doleschall, 1857). Ch., 1959: 199, ♀
C. monulfi Chrysanthus, 1960. Ch., 1960: 26, ♀
C. unicolor (Doleschall, 1857). Ch., 1959: 201, ♀
Gasteracantha brevispina (Doleschall, 1857). Ch., 1959: 203; 1960: 25, ♀ ♂ n
G. taeniata (Walckenaer, 1842). Ch., 1959: 202; 1960: 23, ♀ ♂ n
G. theisi (Guérin, 1838). Ch., 1959: 203, ♀ ♂
Larinia phthisica (L. Koch, 1871). Ch. 1961: 205, ♀, **NG**
L. tabida (L. Koch, 1871). Ch., 1961: 205, ♀
Nephila maculata (Fabricius, 1793). Ch., 1959: 197; 1960: 23, ♀ ♂
N. malabarensis (Walckenaer, 1842). Ch., 1959: 199, ♀
Poecilopachys verrucosa (L. Koch, 1871). Ch., 1961: 209, ♀
Poltys illepidus C. L. Koch, 1843. Ch., 1961: 211, ♀
P. sigillatus Chrysanthus, 1961. Ch., 1961: 211, ♀

TETRAGNATHIDAE

Eucta javana Thorell, 1890. Ch., 1963: 733, ♀
Leucauge argentata (Cambridge, 1869) *marginata* Kulczynski, 1911. Ch., 1963: 731, ♀

L. granulata (Walckenaer, 1842). Ch., 1963: 731, ♀ ♂
L. grata (Guérin, 1838). Ch., 1963: 729, ♂
Mesida humilis Kulczynskki, 1911. Ch., 1963: 727, ♀ ♂ n (second record)
Tetragnatha mandibulata Walckenaer, 1842. Ch., 1963: 733, ♀ ♂
T. rubriventris Doleschall, 1857. Ch., 1963: 735, ♀ ♂
Tylorida striata (Thorell, 1877). Ch., 1963: 727, ♀.

PISAURIDAE

Dolomedes chroesus Strand, 1911. Ch., 1967a: 422, ♀ ♂ n (second record)
D. facetus L. Koch, 1876. Ch., 1967a: 423, ♀ ♂, **NG**
Perenethis unifasciata (Doleschall, 1859). Ch., 1967a: 421, ♀ ♂

LYCOSIDAE

Anomalomma cinctipes Simon, 1898. Ch., 1967a: 425, ♀
A. muju Chrysanthus, 1967. Ch., 1967a: 425, ♀ ♂
Artoria parvula Thorell, 1877. Ch., 1967a: 423, ♀
Varacosa hickmani Roewer, 1954. Ch., 1967a: 423, ♀ ♂ n, **NG** (second record)
V. papakula (Strand, 1911). Ch., 1967a: 424, ♂ ♀ n (second record)
V. tanna (Strand, 1913). Ch., 1967a: 424, ♀, **NG**

OXYOPIDAE

Oxyopes macilentus L. Koch, 1878. Ch., 1967a: 419, ♀ ♂
O. papuanus Thorell, 1881. Ch., 1967a: 419, ♀ ♂
O. tapponiformis Strand, 1911. Ch., 1967a: 421, ♀ (second record)

CLUBIONIDAE

Cheiracanthium lanceolatum Chrysanthus, 1967. Ch., 1967a: 407, ♀
C. marplesi Chrysanthus, 1967. Ch., 1967a: 403, ♀ ♂
C. wiehlei Chrysanthus, 1967. Ch., 1967a: 405, ♀ ♂
Clubiona ericius Chrysanthus, 1967. Ch., 1967a: 409, ♀ ♂
C. kowong Chrysanthus, 1967. Ch., 1967a: 407, ♀ ♂
C. meraukensis Chrysanthus, 1967. Ch., 1967a: 411, ♀ ♂
C. pantherina Chrysanthus, 1967. Ch., 1967a: 413, ♀
C. papuana Chrysanthus, 1967. Ch., 1967a: 413, ♀
C. procera Chrysanthus, 1967. Ch., 1967a: 415, ♀
C. subula Chrysanthus, 1967. Ch., 1967a: 415, ♂
Matidia chlora Chrysanthus, 1967. Ch., 1967a: 415, ♀
M. muju Chrysanthus, 1967. Ch., 1967a: 417, ♂ ♀

EUSPARASSIDAE

Clastes freycineti Walckenaer, 1837. Ch., 1965: 369, ♀ ♂
Heteropoda atriventris Chrysanthus, 1965. Ch., 1965: 356, ♀
H. erythra Chrysanthus, 1965. Ch., 1965: 362, ♀ ♂
H. fusciventris Chrysanthus, 1965. Ch., 1965: 366, ♀ ♂

H. mindiptanensis Chrysanthus, 1965. Ch., 1965: 359; 1967a: 403, ♂
H. rubra Chrysanthus, 1965. Ch., 1965: 360, ♀ ♂
H. venatoria (Linné, 1767). Ch., 1965: 356, ♀ ♂
Isopeda goliath Chrysanthus, 1965. Ch., 1965: 348, ♀
I. meraukensis Chrysanthus, 1965. Ch., 1965: 346, ♀ ♂
Olios artemis Hogg, 1915. Ch., 1965: 353; 1967a: 401, ♀ n (second record)
O. fimbriatus Chrysanthus, 1965. Ch., 1965: 355; 1967a: 403, ♀
O. insignifer Chrysanthus, 1965. Ch., 1965: 353, ♀ ♂
O. rubriventris (Thorell, 1881). Ch., 1965: 351; 1967a: 401, ♀
Pandercetes isopus Thorell, 1881. Ch., 1965: 368, ♀ ♂ n
Thelcticopis cuneissignata Chrysanthus, 1965. Ch., 1965: 349, ♀

THOMISIDAE

Borboropactus divergens (Hogg, 1914). Ch., 1964: 89, ♀ (second record)
Cymbacha saucia L. Koch, 1874. Ch., 1964: 95, ♀, **NG**
Diaea limbata Kulczynski, 1911. Ch., 1964: 102, ♀ ♂ (second record)
D. sticta Kulczynski, 1911. Ch., 1964: 102, ♀ ♂ n (second record)
Hedana bonneti Chrysanthus, 1964. Ch., 1964: 87, ♀
Lycopus atypicus Strand, 1911. Ch., 1964: 92, ♀ (second record)
Misumena alpha Chrysanthus, 1964. Ch., 1964: 97, ♀
M. beta Chrysanthus, 1964. Ch., 1964: 99, ♀
M. gamma Chrysanthus, 1964. Ch., 1964: 99 ♀
M. lorentzi Kulczynski, 1911. Ch., 1964: 95, ♀, misidentified
Philodromus planus (L. Koch, 1875). Ch., 1964: 91, ♂ n, **NG**
Runcinia acuminata (Thorell, 1881). Ch., 1964: 99, ♀, **NG**
Senoculifer dentibulbis Balogh, 1936. Ch., 1964: 91, ♂ (second record)
Stephanopis monulfi Chrysanthus, 1964. Ch., 1964: 89, ♀
Tharrhalea albipes L. Koch, 1875. Ch., 1964: ♀ ♂, **NG**
Thomisus spectabilis Doleschall, 1859. Ch., 1964: 102, ♀ ♂
Tmarus homanni Chrysanthus, 1964. Ch., 1964: 94, ♀

SALTICIDAE

Bathippus macrognathus (Thorell, 1881). Ch., 1968: 59, ♂
B. papuanus (Thorell, 1881). Ch., 1968: 61, ♂
Bavia aericeps Simon, 1877. Ch., 1968: 51, ♀ ♂
Cosmophasis bitaeniata (Keyserling, 1882). Ch., 1968: 65, ♀ ♂
C. micarioides (L. Koch, 1880). Ch., 1968: 67, ♀ ♂
Cytaea frontaligera (Thorell, 1881). Ch., 1968: 53, ♀ ♂
C. mitellata (Thorell, 1881). Ch., 1968: 55, ♂ (second record)
C. nimbata (Thorell, 1881). Ch., 1968: 53, ♂ ♀ n (second record)
Dendryphantes laticeps Strand, 1911. Ch., 1968: 67, ♂ ♀ n
Diolenius amplectens Thorell, 1881. Ch., 1968: 51, ♀ ♂ n
Euryattus bleekeri (Doleschall, 1859). Ch., 1968: 55, ♀ ♂
E. porcellus Thorell, 1881. Ch., 1968: 59, ♀ ♂
Linus fimbriatus (Doleschall, 1859). Ch., 1968: 49, ♀
Menemerus bivittatus (Dufour, 1831). Ch., 1968: 68 ♀ ♂

Mopsus mormon Karsch, 1878. Ch., 1968: 63, ♀ ♂
Palpelius beccarii (Thorell, 1881). Ch., 1968: 61, ♀ ♂
Plexippus paykullii (Audouin, 1827). Ch., 1968: 61, ♀ ♂
Poecilorchestes decoratus Simon, 1901. Ch., 1968: 65, ♀ n
Sandalodes bernsteini (Thorell, 1881). Ch., 1968: 59, ♂ (second record)
Trite longula (Thorell, 1881). Ch., 1968: 59, ♂, **NG**
Zenodorus durvillii (Walckenaer, 1837). Ch., 1968: 63, ♀ ♂

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Fecenia angustata (Thorell, 1881). Ch., 1967b: 102, ♀ ♂ n
F. buruana Reimoser, 1936. Ch., 1967b: 104, ♀ ♂
F. maforensis Simon, 1906. Ch., 1967b: 104, ♀
Psechrus argentatus (Doleschall, 1857). Ch., 1967b: 105, ♀
Titanoeca fulmeki Reimoser, 1927. Ch., 1967b: 102, ♀ ♂ n (second record)
Uloborus albofasciatus Chrysanthus, 1967. Ch., 1967b: 98, ♀ ♂
U. geniculatus (Olivier, 1789). Ch., 1967b: 98, ♀ ♂
U. hilaris Simon, 1906. Ch., 1967b: 98, ♀

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No. 1. A. J. Besseling, 1964. — De Nederlandse Watermijten (Hydrachnellae Latreille, 1802) (The Hydrachnellae of the Netherlands), 199 pp., 333 figs., D.Fl. 25.— (£ 2.10.—, $ 6.95).

NEUE KRÄTZMILBEN VON EINHEIMISCHEN INSEKTIVOREN (PSORERGATIDAE: TROMBIDIFORMES)

von

F. LUKOSCHUS

Zoölogisch Laboratorium der Katholieke Universiteit, Nijmegen

Zusammenfassung

Es werden drei neue *Psorergates* (*Psorergates*)-Arten, die intraepithelial bei Insektivoren parasitieren, beschrieben und in ihrer systematischen Stellung zu den bislang bekannten 18 Arten der Untergattung *Psorergates (Psorergates)* diskutiert. Die neuen Arten *Psorergates (Psorergates) talpae, crocidurae* und *sorici* wurden bei den niederländischen Wirten *Talpa europaea europaea* L., *Crocidura russula russula* (Hermann) und *Sorex araneus araneus* L. und bei den gleichen Wirtsarten in Südfrankreich und Nordspanien gefunden.

Einleitung

In einer vorangegangenen Untersuchung wurde *Psorergates (Psorergates) desmanae* Lukoschus, 1968 von *Galemys pyrenaicus* E. Geoffroy Saint Hilaire als erste Art dieser Familie von einem Insektivoren beschrieben. Alle übrigen Arten der Untergattung sind Parasiten von Rodentia (Tyrell, 1883; Michael, 1889; Till, 1960; Fain, 1961; Fain, Lukoschus & Hallmann, 1966; Lukoschus, Fain & Beaujean, 1967).

Die neuen Arten wurden von frischgefangenen Wirten aus mehreren Fanggebieten des Zoologischen Institutes Nijmegen, sowie von Alkoholmaterial des Zoologischen Laboratoriums, Leiden, des Laboratoire Arago in Banyuls-sur-Mer (Pyr. Or.) und des Centro Pirenaico de Biologia Experimental in Jaca (Huesca) abgesammelt. Den Direktoren der Institute sei auch an dieser Stelle für ihr Entgegenkommen gedankt.

Typen und Paratypen wurden in den folgenden Museen und Instituten deponiert: Rijksmuseum van Natuurlijke Historie, Leiden; British Museum (Natural History), London; Muséum National d'Histoire Naturelle, Paris; U.S. National Museum, Washington; Zoologisches Staatsinstitut und Museum, Hamburg; Institut de Médecine Tropicale Prince Léopold, Antwerpen; Zoologisches Institut der Akademie der Wissenschaften, Leningrad; Departamento de Zoologia del Suelo y Entomología aplicada, Madrid; Zoölogisch Laboratorium der Katholieke Universiteit, Nijmegen, im Text abgekürzt als Leiden, London usw.

Beschreibungen

Psorergates (Psorergates) talpae spec. nov. (Abb. 1-19)

Mit den Charakteren der Familie Psorergatidae Dubinin (1955) und der Untergattung *Psorergates* Tyrell (Fain, 1961).

Weibchen (Holotype). — Körperform und Körpergliederung wie bei den anderen Arten des Genus. Länge einschliesslich Gnathosoma 129 μ, bei 31 gemessenen Paratypen im Mittel 136 μ (126—144). Breite 101 μ, bei den Paratypen Ø 105 μ (99—117).

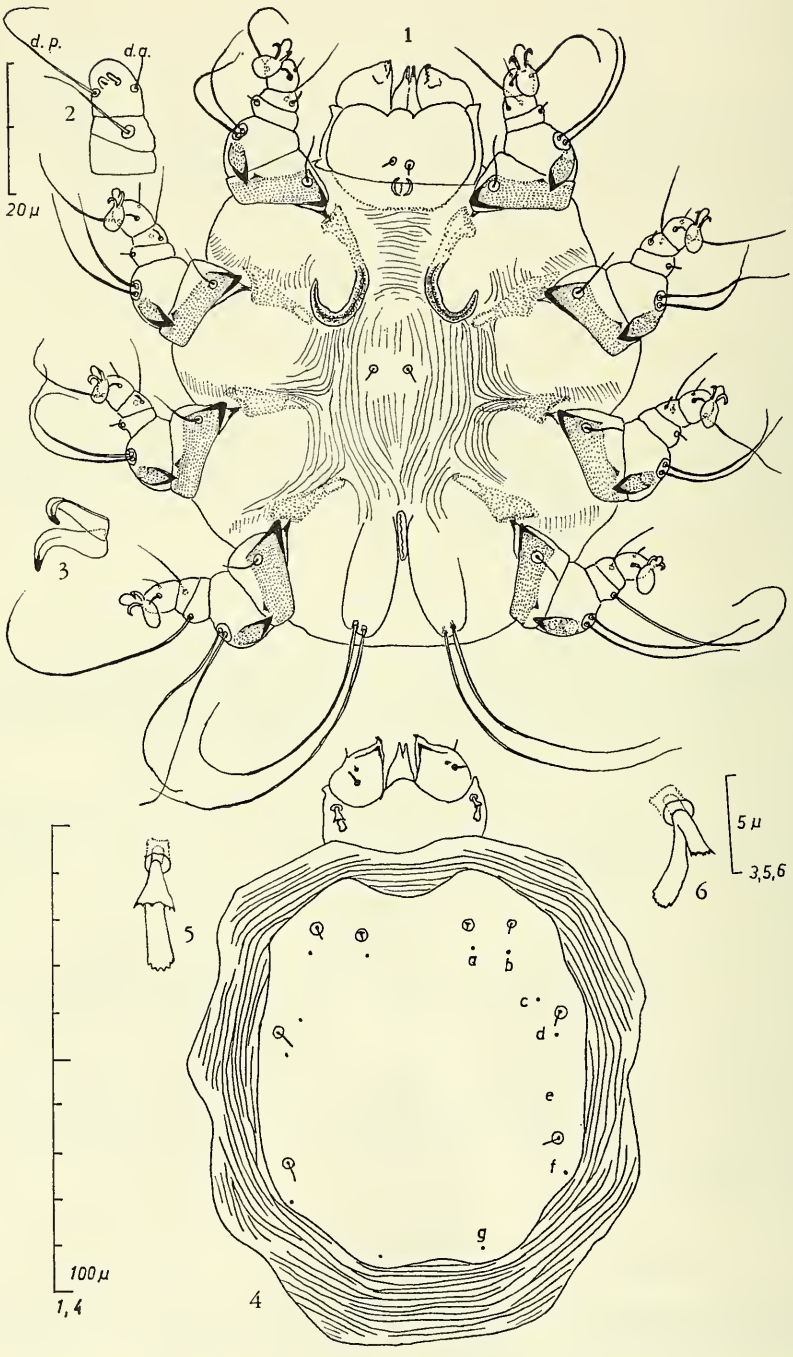

Abb. 1—6. *Psorergates* (*Psorergates*) *talpae* spec. nov., Weibchen (Holotype). 1. Ventralansicht, 2. Bein II, Tibia-Tarsus dorsal, 3. Krallenpaar stark vergrössert, 4. Dorsalansicht, 5. Gnathosomahaar dorsal, 6. Gnathosomahaar seitlich.

Ventralansicht (Abb. 1). Die weichhäutige Ventralfläche ist regelmässig fein gewellt. Die Anordnung der Wellung ist auch bei 43 daraufhin beobachteten Paratypen gleichartig. Die Ventralhaare von 3—4 μ stehen 8 μ (7—11 bei den Paratypen) weit auseinander. Die Epimeren I sind am hinteren Ende halbkreisförmig nach aussen gebogen. Der halbkreisförmige Epimerenteil ragt kielartig aus der Ventralfläche heraus. Die Epimeren II—IV und der vordere Teil der Epimeren I liegen im Körperinneren dicht unter der gewellten Ventralfläche. Die Wellung geht über die Epimeren hinweg. Terminalhaare von ca. 65 μ.

Die Beine sind ventral, weit seitlich eingesetzt. Alle Trochanteres besitzen nach unten und zum vorderen Körperdrittel gerichtete kräftige, an der Spitze leicht abgerundete Apophysen. Distal von den Apophysen stehen 9—11 μ lange Haare. Der Basalteil des Trochanters ist stärker chitinisiert. Diese Chitinversteifung läuft gegenüber der Femurapophyse in eine kleine abstehende Hautduplikatur aus. Der Femur aller Beinpaare trägt auf der Aussenseite auf einer kleinen stärker chitinisierten Platte ein Haarpaar und an seiner hinteren Ventralseite eine weit nach unten gerichtete spitze Apophyse. Bei den Haarpaaren ist das äussere Haar etwas länger. Es misst auf Femora I-III 28—36 μ, auf Femur IV 33—39 μ. Auf der hinteren Ventralseite steht auf einem kleinen Höcker von Genu I-III ein dünnes 3 μ langes, und von Genu IV ein sehr dickes 50—55 μ langes Haar. Die kurze Tibia trägt ventral vorn einen kurzen Dorn (fehlt auf Tibia IV) und dorsal median ein längeres Haar. Der Tarsus trägt ventral vorn einen kurzen, deutlich gekrümmten Dorn, dorsal lateral zwei Haare. Im Gegensatz zu den bislang beschriebenen Arten der Untergattung von Rodentia, bei denen die Dorsalhaare der Tarsi etwa gleichlang ausgebildet sind, messen die setae d.p. (fehlt auf Tarsus IV) 16—20 μ, die setae d.a. dagegen nur 4 μ (Abb. 2). Die beiden kräftigen einspitzigen Krallen (Abb. 3) und das zweiteilige Haftläppchen sind ventral am Tarsusende angesetzt. Die Tarsi I und II besitzen dorsal einen grösseren Sinneskolben und ein winziges Sinneshaar in einer kleinen Hautduplikatur.

Dorsalansicht (Abb. 4). Das vorn auffällig eingebuchtete Rückenschild ist gut chitinisiert und bis zum Schildrande fein punktiert. Die weichhäutige Rückenfläche ist regelmässig fein gewellt. Die Schildlänge beträgt (paramedian gemessen) 86 μ, bei den Paratypen Ø 86 μ (80—96), die Breite 72 μ, bei den Paratypen Ø 73 μ (70—76). Einige Paratypen besitzen am Schildhinterrande weniger ausgeprägte Einbuchtungen. Die Schildhaare stehen auf kleinen, hellen unpunktierten Höfen. Die drei seitlichen Haarpaare, die deutlich vom Schildrande entfernt stehen, messen 4—5 μ, die vorderen paramedianen sind sehr kurz, jedoch als Haare noch deutlich zu erkennen. Auf der Schildfläche sind in regelmässiger Anordnung 12 dunkle Punkte vorhanden. Bei 25 daraufhin untersuchten ♀ ♀ fehlen in einem Falle die Punkte in Stellung a, bei einem anderen die in Stellung d.

Gnathosoma und Mundteile sind wie bei den anderen *Psorergates*-Arten aufgebaut. Das 6 μ lange Gnathosomahaar ist flach und am Ende mehrfach eingekerbt (Abb. 5). Die breitere, aufliegende Deckschuppe ist in mehrere feine Spitzen ausgezogen. Der Aufbau des komplizierten Haares ist aus Seitenansichten (Abb. 6) zu ersehen. Die Variabilität des Haarrandes wird durch die Abb. 12—15 gezeigt. Das hintere Palptibiahaar von ca. 4 μ (Abb. 19) ist am Ende abgesetzt und etwas dünner.

Männchen (Allotype). — Körperlänge einschliesslich Gnathosoma 120 μ, bei 7 Paratypen Ø 115 μ (108—120), Breite 99 μ, bei den Paratypen Ø 94 μ (90—99).

Ventralansicht wie beim Weibchen, jedoch nur zwei Terminalhaare auf einer lang-

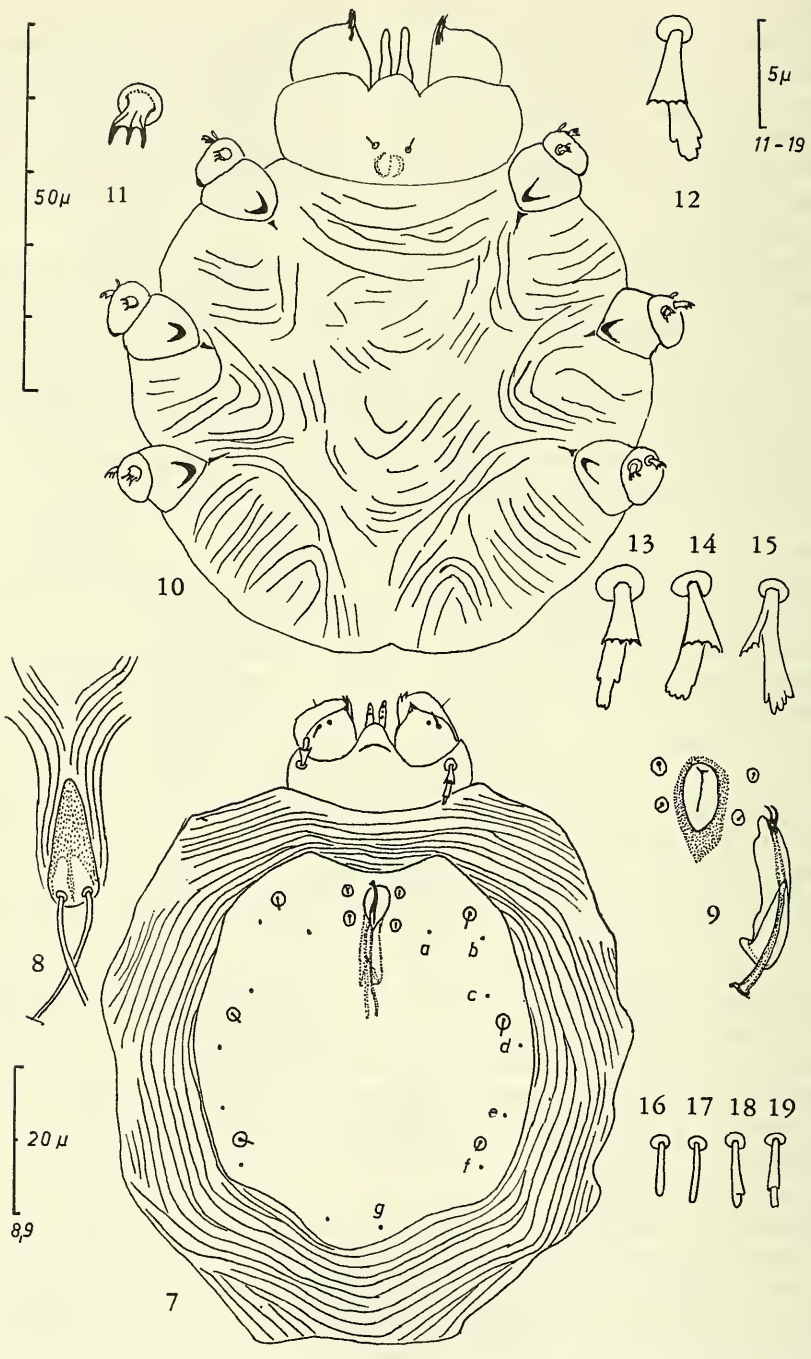

Abb. 7—19. *Psorergates* (*Psorergates*) *talpae* spec. nov. 7. Männchen (Allotype) dorsal, 8. Sklerit der Terminalhaare der Allotype, 9. Genitalregion und Penis einer Paratype, 10. Larve ventral, 11. Beinkralle stärker vergrössert, 12—15. Gnathosomahaare der Larve (12), der Protonymphe (15), der Deutonymphe (14) und des Männchens (13), 16—19. hintere Palptibiahaare der Larve (16), der Protonymphe (17), der Deutonymphe (18) und des Weibchens (19).

Tabelle I. Messwerte und Determinationsmerkmale von *Psorergates*-Weibchen von Insektivoren. Angaben in μ.

Art: Anzahl gemessene Exemplare:	*desmanae* 12	*talpae* 31	*crocidurae* 10	*sorici* 10
Körperlänge im Durchschnitt	156	*136*	*129*	*123*
Körperlänge Minimum	135	126	123	117
Körperlänge Maximum	168	144	138	135
Körperbreite im Durchschnitt	127	*105*	*104*	*95*
Körperbreite Minimum	108	99	96	93
Körperbreite Maximum	140	117	112	99
Terminalhaare	ca. 90	ca. 65	ca. 55	52—60
Ventralhaare	5—6	3—4	2	4
Ventralhaarabstand	9—11	7—11	13—18	9—12
Trochanterhaare	10—12	9—11	8	9—10
Anzahl Femurhaare IV	2	2	2	1
Femurhaare I-III	20—28	28—36	20—25	20—25
Femurhaare IV	36—45	33—39	25—33	28—33
Genuhaare I-III	5	3	3	2
Genuhaare IV	51—60	50—55	30—35	30—35
Tarsus II d.a.	6	4	3	3—4
Tarsus II d.p.	15—18	16—20	0	14—18
Schildlänge im Durchschnitt	91	86	82	81
Schildlänge Minimum	87	80	78	76
Schildlänge Maximum	96	96	85	87
Schildbreite im Durchschnitt	84	73	69	66
Schildbreite Minimum	75	70	66	63
Schildbreite Maximum	90	76	72	72
Genitalöffnung	9—12	10—11	12	10—12
Palptibiahaar	5—6	4	3	2—3
Gnathosomahaar	9—10	6	7	9
Anzahl Krallenspitzen	1	1	3	2

eiförmigen stärker chitinisierten Platte, die auf einem medianen Längswulst liegt (Abb. 8). Haare etwas kürzer als beim Weibchen, Messdaten in Tabelle II.

Dorsalansicht (Abb. 7). An der Mitte des Vorderrandes des Rückenschildes eine ovale Genitalöffnung mit zwei Paaren winziger Härchen auf kleinen, hellen, runden Schildchen. Das vordere Haarpaar steht 10 μ, das hintere 9 μ weit auseinander. Der zweispitzige Penis misst 25 μ (25—29 bei den Paratypen), seine dorsal aufgeschlitzte Scheide 18 μ. Die Seitenansicht des Penis (Abb. 9) von einem Quetschpräparat macht den Aufbau deutlich. Auf der Schildfläche sind auch bei allen Paratypen 12 dunkle Punkte in gesetzmässiger Anordnung vorhanden.

Entwicklungsstadien. — Die dünnschaligen, fast runden Eier messen 85 μ: 79 μ (Ø aus 10).

Die Larven von durchschnittlich 93 μ Länge und 78 μ Breite zeigen bei gleichem Habitus wie bei anderen Arten der Untergattung eine auffällige regelmässige Wellung der Ventralseite (Abb. 10) und der Dorsalseite. Die Krallen der Beinendglieder sind

Tabelle II. Messwerte und Determinationsmerkmale von *Psorergates*-Männchen von Insektivoren. Angaben in μ.

Art:	*desmanae*	*talpae*	*crocidurae*	*sorici*
Anzahl gemessene Exemplare:	5	7	10	10
Körperlänge im Durchschnitt	137	*115*	*111*	*111*
Körperlänge Minimum	132	108	105	102
Körperlänge Maximum	146	120	114	115
Körperbreite im Durchschnitt	112	*94*	*90*	*87*
Körperbreite Minimum	105	90	85	84
Körperbreite Maximum	120	99	93	93
Terminalhaare	72—89	*51—54*	*42—48*	*52—60*
Ventralhaare	4—5	3	2—3	3—4
Ventralhaarabstand	7—8	7—10	12—14	10—14
Trochanterhaare	9—10	7—8	8—9	7
Anzahl Femurhaare IV	2	2	2	*1*
Femurhaare I-III	15—20	25—28	18—23	20—25
Femurhaare IV	25—36	30—33	20—25	20—25
Genuhaare I-III	4	3	3	2
Genuhaare IV	35—40	40—45	30—33	27—34
Tarsus II d.a.	5	3	2	3
Tarsus II d.p.	14—15	14—16	*0*	15
Schildlänge im Durchschnitt	87	73	77	73
Schildlänge Minimum	84	72	75	70
Schildlänge Maximum	90	74	84	78
Schildbreite im Durchschnitt	77	64	67	59
Schildbreite Minimum	75	62	64	57
Schildbreite Maximum	81	66	70	62
2. Schildhaar	4—4,5	4	3—4	3—4
Palptibiahaar	5	3,5	3	2
Gnathosomahaar	9—10	6	7—8	7—8
Penis	28—31	25—29	24—27	*36—38*
Penisscheide	23—24	*18*	*15—16*	*11—14*
Genitalhaarabstand vorn	9—10	10—11	12—13	12—14
Genitalhaarabstand hinten	10—11	9	7—8	5
Anzahl Krallenspitzen	1	1	*3*	*2*

dreispitzig (Abb. 11). Auf den Beinen I und II ist je ein Sinneskolben vorhanden. Die Gnathosomahaare (Abb. 12) sind in der gleichen Grösse wie bei den Adulten ausgebildet (Abb. 5, 6 von ♀, 13 von ♂). Die Art unterscheidet sich dadurch von allen bislang beschriebenen Arten von Rodentia. Die dorsalen hinteren Palptibiahaare (Abb. 16) sind ebenfalls fast in der gleichen Form und Grösse wie bei den Adulten vorhanden.

Die Protonymphen von durchschnittlich 111 μ Länge und 90 μ Breite besitzen gleichartig gebildete Gnathosomahaare (Abb. 15) und Palptibiahaare (Abb. 17). Im Ventralbereich der Ventralseite ist die Wellung längsgerichtet.

Die Existenz der morphologisch etwa gleichgebauten Deutonymphe geht aus Häu-

tungsstadien hervor, in denen sich eine Form mit vier Paaren kurzer, zweigliedriger Beine in einer gleichartigen Form entwickelt. Die Deutonymphen sind im Durchschnitt 130 μ lang und 103 μ breit. Deutonymphen, in denen sich Adulte entwickeln, zeigen Gnathosomahaare wie Abb. 14 und Palptibiahaare wie Abb. 18. Die Wellung der Ventralseite ähnt der des Weibchens. Bei gutgestreckten Präparaten können Proto- und Deutonymphe durch die Stellung der Beine IV unterschieden werden. Bei der Deutonymphe ist der Abstand der Beine voneinander fast doppelt so gross wie bei der Protonymphe.

Wirt und Verbreitung. — Die Typenserie entstammt einer *Talpa europaea europaea* L., die am 22.VI.1967 bei Nijmegen gefangen wurde. Weitere parasitierte Tiere der gleichen Wirtsart: 4 aus der Umgebung des Typenfangplatzes 6.VI.1967—24.I.1968, 7 aus der Umgebung von Villanua, Prov. Huesca, Spanien, 11.VII.1966—20.V.1967 (Alkoholmaterial des Centro Pirenaico de Biologia Experimental, Jaca).

Einfluss der Parasiten auf den Wirt. — Die Milben sitzen oberflächlich in der Epidermis des äusseren Gehörganges. Sie verursachen dort Hyperceratosis und Hyperfunktion der Talgdrüsen. Bei den bislang untersuchten, nur schwach parasitierten Wirten wurde ein Befall anderer Körperstellen nicht festgestellt.

Typen. — Holotype ♀ und Allotype ♂ in Leiden. Paratypen ♀ und ♂ in London, Paris, Washington, Antwerpen, Nijmegen. Paratypen ♀ in Hamburg, Leningrad, Madrid.

Psorergates (Psorergates) crocidurae spec. nov. (Abb. 20—32)

Mit den Charakteren der Familie Psorergatidae Dubinin (1955) und der Untergattung *Psorergates* Tyrell (Fain, 1961).

Weibchen (Holotype). — Länge einschliesslich Gnathosoma 135 μ, bei 10 gemessenen Paratypen Ø 129 μ (123—138). Breite 108 μ, bei den Paratypen Ø 104 μ (96—112).

Ventralansicht (Abb. 23). Die weichhäutige Ventralfläche ist im medianen Bereich schwach längsgewellt. Die sehr kurzen Ventralhaare (2 μ) stehen 16 μ (13—18 μ bei den Paratypen) weit auseinander. Die Epimeren I sind am Ende nach aussen gebogen und mit einer feinen nach vorn laufenden Linie eiförmig geschlossen. Ein halbkreisförmiger Epimerenteil ragt kielartig aus der Ventralfläche heraus. Die unter der Körperoberfläche liegenden Epimeren II-IV besitzen an ihren inneren Enden langovale helle Flächen. Die zwischen den beiden Längswülsten langgestreckte Genitalöffnung von 12 μ ist in ihrem vordersten Teil durch eine Hautduplikatur der Ventralfläche überdeckt. Die Terminalhaare sind etwa 55 μ lang.

Die Beine sind ventral, weit seitlich eingesetzt. Alle Trochanteres haben nach unten und zum vorderen Körperdrittel gerichtete kräftige spitze Apophysen. Trochanterhaare ca. 8 μ. Der stärker chitinisierte Basalteil des Trochanters läuft gegenüber der Femurapophyse in eine sehr kleine, abstehende Hautduplikatur aus. Der Femur aller Beinpaare trägt auf der ventralen hinteren Seite ein Haarpaar und eine nach unten abstehende, spitze Apophyse. Bei den Haarpaaren ist das äussere Haar etwas länger. Es misst auf Femur I-III 20—25 μ, auf Femur IV 25—33 μ. Die Haare auf Genu I-III sind sehr kurz (3 μ), auf Genu IV sehr kräftig und 30—35 μ lang. Die kurze Tibia trägt ventral vorn einen kurzen gekrümmten Dorn (fehlt auf Bein IV) und dorsal median ein längeres Haar. Die Tarsi haben ventral vorn einen kurzen kräftigen Dorn und dorsal sehr fein, 3 μ lange setae d.a. (Abb. 24). Die dorsale posteriore setae sind nicht vorhan-

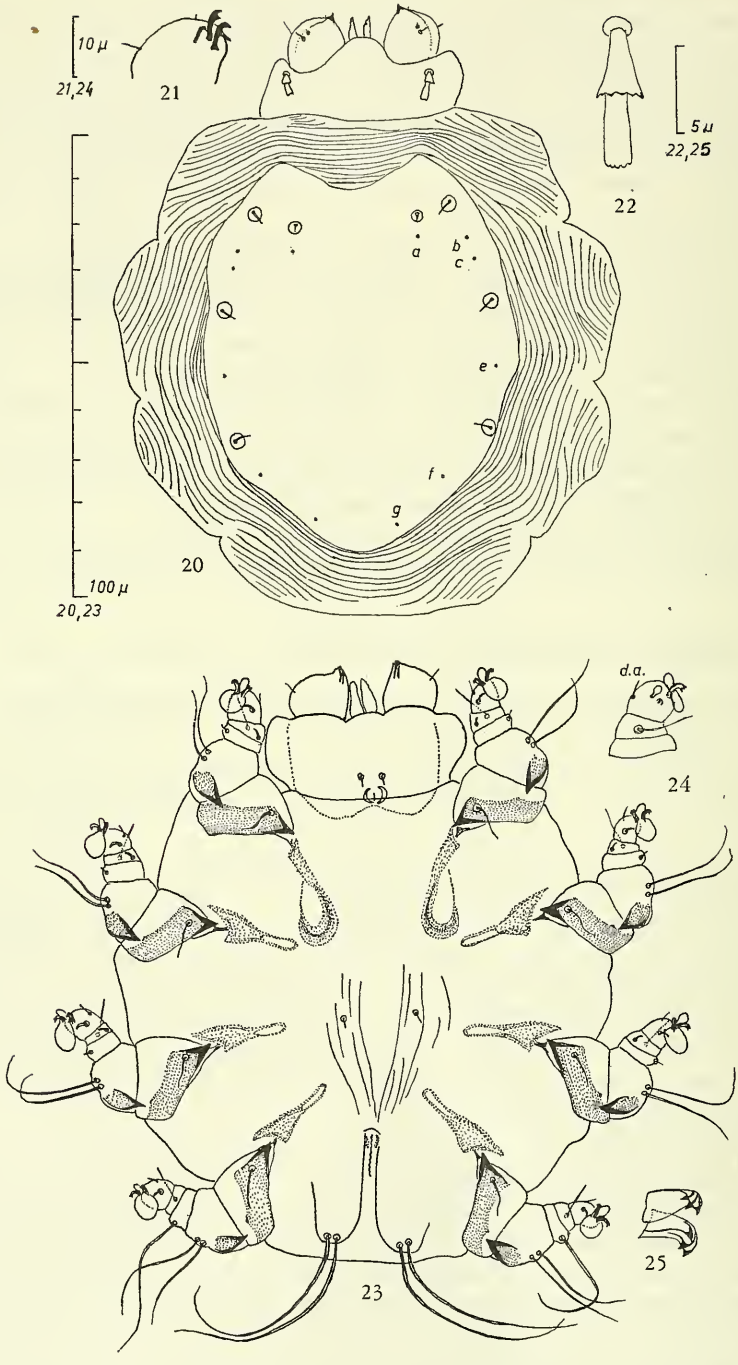

Abb. 20—25. *Psorergates* (*Psorergates*) *crocidurae* spec. nov. 20. Holotype Weibchen dorsal, 21. Palptarsus einer gequetschten Paratype, 22. Gnathosomahaar der Holotype, 23. Holotype Weibchen ventral, 24. Bein II, Tibia-Tarsus dorsal einer Paratype, 25. Krallenpaar stärker vergrössert.

den. Die beiden kräftigen dreispitzigen Krallen (Abb. 25) und das zweigeteilte Haftläppchen sind ventral am Tarsusende angesetzt. Auf Tarsus I und II ist dorsal je ein dickerer Sinneskolben und ein winziges Sinneshaar in einer kleinen Hautduplikatur vorhanden.

Dorsalansicht (Abb. 20). Das am Vorderrande auffällig eingebuchtete Rückenschild ist gut chitinisiert und bis zum Schildrande deutlich fein punktiert. Die Schildlänge (von der Verbindungslinie der vorderen Spitzen an gemessen) beträgt 82 μ, bei den Paratypen Ø 82 μ (78—85), die Breite 69 μ, bei den Paratypen Ø 69 μ (66—72). Die Schildhaare stehen auf kleinen unpunktierten Höfen, seitliche Schildhaare 4 μ, vordere paramediane Haare 1 μ. Auf der Schildfläche sind in regelmässiger Anordnung 12 dunkle Punkte vorhanden.

Gnathosoma und Mundteile sind wie bei anderen *Psorergates*-Arten aufgebaut. Abb. 21 zeigt die Ausbildungsform der Palptarsuskrallen von einer gequetschten Paratype. Das ca. 7 μ lange, abgeflachte Gnathosomahaar ist am Ende mehrfach eingekerbt, die aufliegende breitere Deckschuppe ist am Rande in 5—7 abgestumpfte Enden ausgezogen (Abb. 22). Die feinen hinteren Palptibiahaare messen nur 3 μ.

Männchen (Allotype). — Körperlänge einschliesslich Gnathosoma 111 μ, bei 10 gemessenen Paratypen Ø 111 μ (105—114). Körperbreite 90 μ, bei den Paratypen Ø 90 μ (85—93).

Ventralansicht wie beim Weibchen, jedoch nur zwei Terminalhaare auf einem langgestreckten stärker chitinisierten Schildchen (Abb. 28). Körper und Beinbehaarung etwas kürzer als beim Weibchen (Messdaten in Tabelle II).

Dorsalansicht (Abb. 26). An der Mitte des Vorderrandes des Rückenschildes liegt die langovale Genitalöffnung inmitten eines Bereiches, der stärker chitinisiert und dichter punktiert ist. Die winzigen Härchen an den Seiten der Genitalöffnung stehen in kleinen, unpigmentierten hellen Höfen. Das vordere Haarpaar steht 12—13 μ, das hintere 7—8 μ weit auseinander. Auf der Rückenschildfläche sind 10 dunkle Punkte in gesetzmässiger Anordnung vorhanden. Der Penis misst 24—27 μ, seine Scheide 15—16 μ. Die Ausbildungsform des Penis wird aus Seitenansichten (Abb. 27) deutlich. Gnathosoma, Mundteile, Palptibiahaare und Gnathosomahaare (Abb. 29) unterscheiden sich nicht vom Weibchen.

Entwicklungsstadien. — Die etwa runden, dünnschaligen Eier (Ø aus 20) messen 85 μ: 76 μ. Larven und Nymphen sind wie bei anderen *Psorergates*-Arten ausgebildet. Die Larven messen (Ø aus 10) 85 : 70 μ. Palptibiahaare und Gnathosomahaare (Abb. 32) unterscheiden sich nicht wesentlich von der Ausbildung der Adulten. Die Protonymphen besitzen dicht beieinander stehende Beine IV. In der Grösse der Gnathosomahaare (Abb. 31) und der Palptibiahaare unterscheiden sie sich nicht wesentlich von anderen Entwicklungsstadien. Die Protonymphen sind im Durchschnitt (10) 100 μ lang und 74 μ breit. Die Deutonymphen haben weiter auseinander stehende Beine IV. Sie messen (Ø aus 10) 126 : 94 μ. Die Gnathosomahaare (Abb. 30) sind wie bei den anderen Entwicklungsstadien ähnlich wie bei den Adulten aufgebaut, die Deckschuppe ist etwas verkürzt.

Wirt und Verbreitung. — Die Typenserie entstammt einer *Crocidura russula russula* (Hermann), die am 12.VI.1967 bei Nijmegen gefangen wurde. Acht Tiere der gleichen Wirtsart von mehreren Fangplätzen in der Umgebung von Nijmegen, ein Wirt von Banyuls (Alkoholmaterial des Laboratoire Arago, Banyuls) und je ein Wirt von Lerida und Madrid (Alkoholmaterial des Centro Pirenaico de Biologia Experimental, Jaca) waren ebenfalls parasitiert.

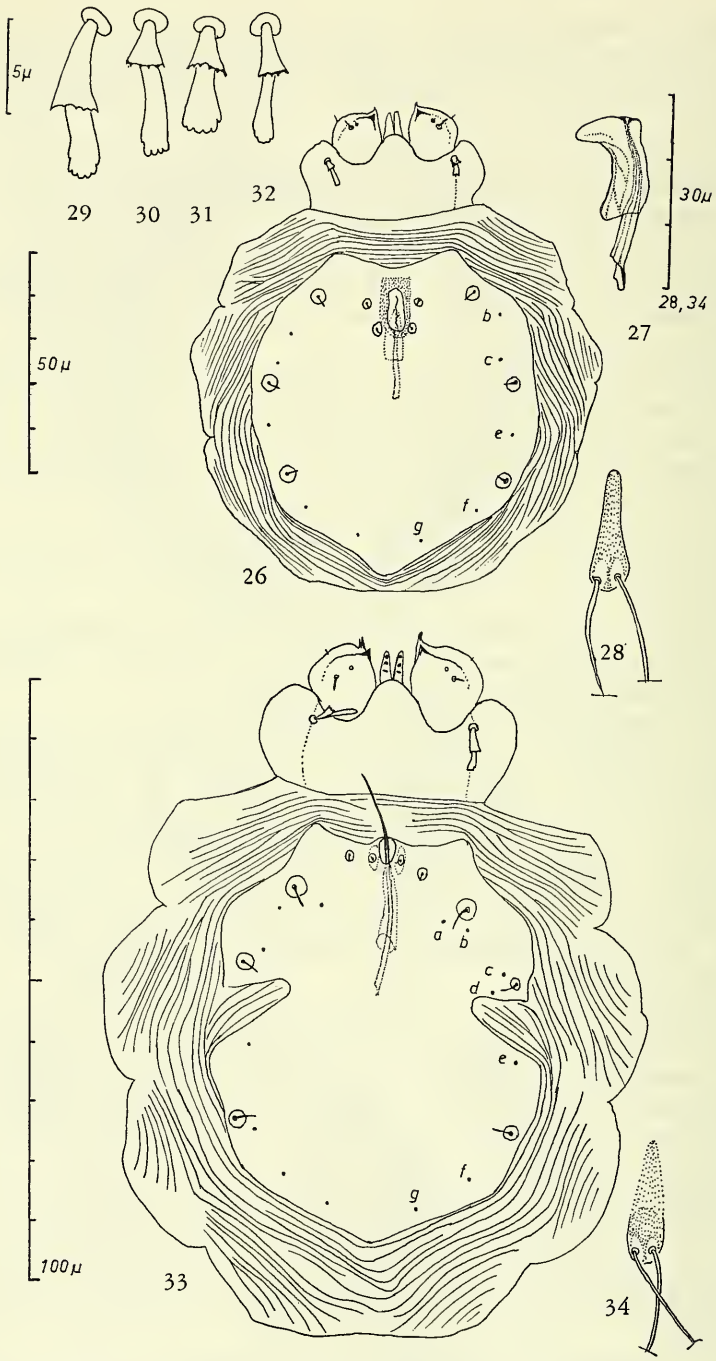

Abb. 26—32. *Psorergates* (*Psorergates*) *crocidurae* spec. nov. 26. Allotype Männchen dorsal, 27. Penis einer Paratype, 28. Sklerit mit Terminalhaaren der Allotype, 29—32. Gnathosomahaare der Allotype (29), der Deutonymphe (30), der Protonymphe (31) und der Larve (32). Abb. 33—34. *Psorergates* (*Psorergates*) *sorici* spec. nov. 33. Dorsalnsicht der Allotype Männchen, 34. Sklerit mit Terminalhaaren der Allotype

Einfluss des Parasiten auf den Wirt. — Die Milben sitzen in der Epidermis des spärlich behaarten Tibiabereiches der Hinterbeine und am Rande der Ohrmuschel und der Ohrmuschelfalten. Sie verursachen dort eine Hypertrophie von Epidermis und Bindegewebe. Bei stärkerem Befall treten blutdurchsetzte Krusten auf. Sekundärinfektionen sind bei älterem Befall wahrscheinlich. Abb. 41 zeigt ein Foto des abgeschnittenen Ohres des Typenwirtes. Auf der Fläche der Ohrmuschelfalte ist ein Befall grösserer Ausdehnung vorhanden, der einige kleine Blutkrusten enthält. Der Rand ist zu acht, teilweise grösseren gallartigen Epidermiswucherungen ausgewachsen.

Typen. — Holotype ♀ und Allotype ♂ in Leiden. Paratypen ♀ und ♂ in London, Paris, Washington, Hamburg, Antwerpen, Leningrad, Madrid, Nijmegen.

Psorergates (Psorergates) sorici spec. nov. (Abb. 33—40)

Mit den Charakteren der Familie Psorergatidae Dubinin (1955) und der Untergattung *Psorergates* Tyrell (Fain, 1961).

Weibchen (Holotype). — Länge einschliesslich Gnathosoma 123 μ, bei 10 gemessenen Paratypen Ø 123 μ (117—135). Breite 96 μ, bei den Paratypen Ø 95 μ (93—99).

Ventralansicht (Abb. 38). Die weichhäutige Ventralfläche ist nur vor der Genitalöffnung schwach gewellt. Die Ventralhaare von 4 μ Länge stehen 9 μ (9—12) weit auseinander. Der vordere Teil der Epimeren I liegt wie die Epimeren II-IV im Körper. Der hintere Epimerenteil I ragt in der Form eines fast geschlossenen Kreises kielartig weit aus der Ventralfläche heraus. Es entsteht der Eindruck von Saugnäpfen. Die Terminalhaare messen 54 μ (52—60). Die ca. 10 μ lange Genitalöffnung liegt langgestreckt zwischen zwei Längswülsten.

Die Beine sind ventral, weit seitlich eingesetzt. Die Trochanterapophysen sind vorn abgestumpft. Die Hautduplikatur der Chitinversteifung der Trochanterbasis ist klein und wenig abstehend. Trochanterhaare 9—10 μ. Der Femur trägt eine weit nach unten abstehende Apophyse und auf Beinpaar I-III zwei Haare, auf Femur IV nur ein Haar. Das äussere wenig längere Haar misst auf Beinpaar I-III 25 μ, auf Bein IV 30 μ. Auf einem kleinen Höcker von Genu I-III steht ein sehr kurzes (2 μ) Haar, von Genu IV ein dickes, 35 μ langes Haar. Die Tibia trägt ventral vorn einen dünnen gekrümmten Dorn (fehlt auf Tibia IV) und dorsal median ein längeres Haar. Der Tarsus hat ventral vorn einen stärkeren gekrümmten Dorn und dorsal lateral zwei Haare ungleicher Länge (Abb. 39); die dorsale anteriore setae messen 3—4 μ, die dorsale posteriore setae 14—18 μ (d.p. fehlt auf Tarsus IV). Die kräftigen zweispitzigen Krallen (Abb. 40) und das zweigeteilte Haftläppchen sind ventral am Tarsusende angefügt. Tarsus I und II besitzen dorsal einen grösseren Sinneskolben und ein winziges Sinneshärchen in einer kleinen Hautduplikatur.

Dorsalansicht (Abb. 35). Das gut chitinisierte und bis zum Rande gleichmässig punktierte Rückenschild ist am Vorderrande eingebuchtet. Die Länge von der Verbindungslinie der beiden vorderen Spitzen an gemessen beträgt 79 μ, bei den Paratypen Ø 81 μ (76—87), die Breite 64 μ, bei den Paratypen Ø 66 μ (63—72). Die Schildhaare stehen auf kleinen unpunktierten Höfen deutlich vom Schildrande entfernt. Die seitlichen Schildhaare sind 4—5 μ lang, die vorderen 1 μ. Auf der Schildfläche sind in regelmässiger Anordnung auch bei allen beobachteten Paratypen 12 dunkle Punkte vorhanden.

Gnathosoma und Mundteile sind wie bei anderen *Psorergates*-Arten aufgebaut. Das ca. 9 μ lange flache Gnathosomahaar ist an seinem Ende unterschiedlich lang gelappt

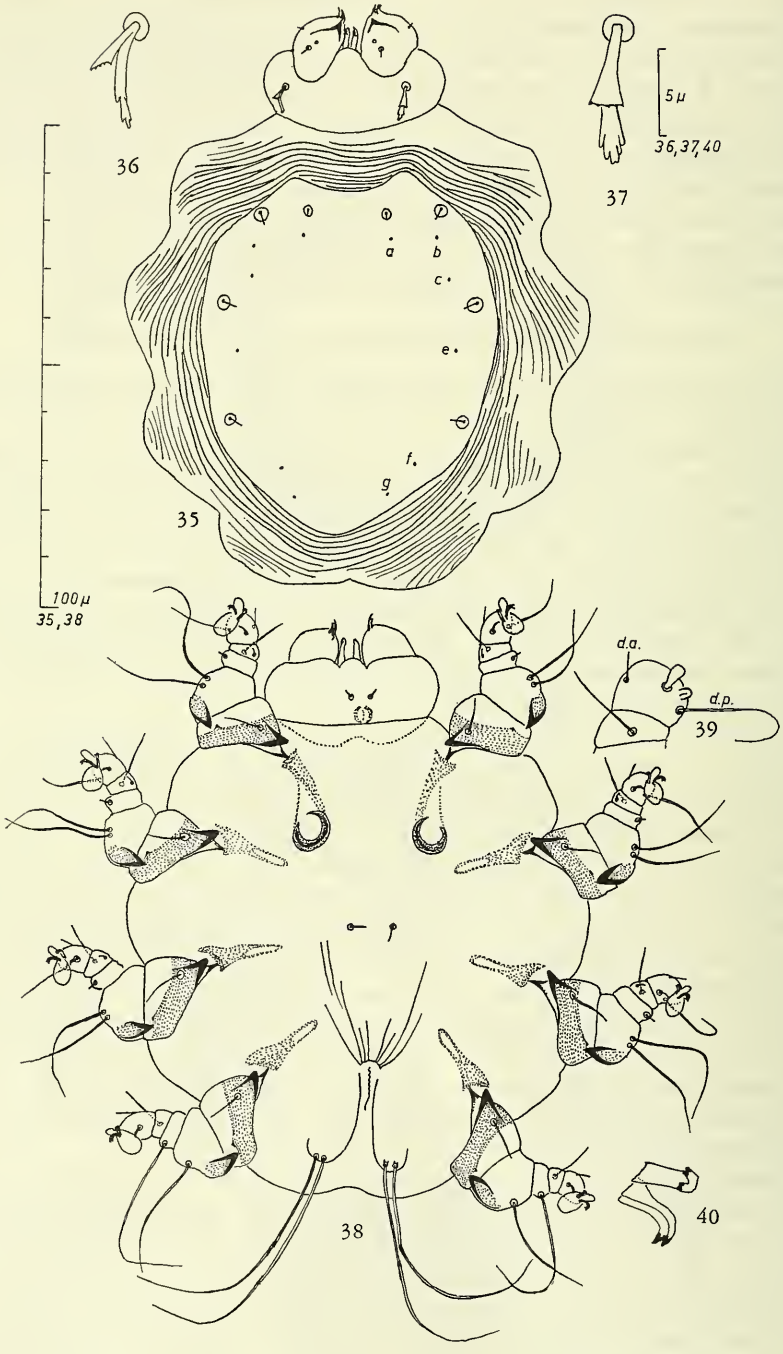

Abb. 35—40. *Psorergates* (*Psorergates*) *sorici* spec. nov. 35. Holotype Weibchen dorsal, 36. Gnathosomahaar der Holotype seitlich, 37. Gnathosomahaar dorsal, 38. Holotype ventral, 39. Bein II, Tibia und Tarsus dorsal, 40. Krallenpaar stärker vergrössert.

(Abb. 37). Der Aufbau aus aufliegender breiter gezähnter Deckschuppe und flachem Haar geht aus Seitenansichten (Abb. 36) hervor. Die dünnen hinteren Palptibiahaare sind nur 2—3 μ lang.

Männchen (Allotype). — Körperlänge einschliesslich Gnathosoma 114 μ, bei 10 gemessenen Paratypen Ø 111 μ (102—115). Breite 90 μ, bei den Paratypen Ø 87 μ (84—93).

Ventralansicht wie beim Weibchen, jedoch mit nur zwei Terminalhaaren auf einem langgestreckten stärker chitinisierten Schildchen (Abb. 34). Haare etwas kürzer als beim Weibchen (Tabelle II).

Dorsalansicht (Abb. 33). Das gut chitinisierte und punktierte Rückenschild besitzt hinter dem 2. Haarpaar typische, bei allen Paratypen gleichförmig ausgebildete Einbuchtungen, in die sich die weichhäutige, regelmässig fein gewellte Rückenhaut hineinzieht. Die Genitalöffnung ist an den Vorderrand des Rückenschildes verlagert. Die inneren (hinteren) Genitalhaare kommen dadurch auf ihren langovalen hellen Schildchen an den Vorderrand des Schildes. Die inneren Härchen stehen 5 μ, die äusseren 12—14 μ weit auseinander. Die Seitenhaare des Schildes stehen auf grösseren hellen Höfen. Der 36—38 μ lange Penis ist sehr dünn und spitz, er ragt bei allen Paratypen weit aus der Genitalöffnung heraus. Die Penisscheide misst nur 11—14 μ. Auf der Schildfläche sind auch bei allen Paratypen 12 dunkle Punkte in regelmässiger Anordnung vorhanden. Bei einigen Paratypen sind zusätzlich Punkte in Stellung d vorhanden.

Entwicklungsstadien. — Die dünnschaligen fast runden Eier sind im Durchschnitt 81 μ : 78 μ gross. Die Entwicklungsstadien sind wie die Adulten im Vergleich zu *P. talpae* und *crocidurae* etwas mehr langgestreckt.

Wirt und Verbreitung. — Die Typenserie entstammt einem *Sorex araneus araneus*

Abb. 41. Abgetrennte Ohrmuschel von *Crocidura russula* (Typenwirt) mit stärkerem *Psorergates*-Befall. Erläuterung im Text. Foto H. J. M. Spruyt.

L., der am 26.V.1967 bei Nijmegen gefangen wurde. Sechs weitere Tiere der gleichen Wirtsart aus der Umgebung von Nijmegen und zwei aus dem Alkoholmaterial des Zoologischen Laboratoriums, Leiden, waren ebenfalls parasitiert.

Einfluss der Parasiten auf den Wirt. — Die Milben sitzen oberflächlich in der Epidermis der Ohrmuschel und des schwachbehaarten Tibiabereiches der Hinterbeine. Sie verursachen dort Hyperceratosis. Blutschorfe an den Hinterbeinen weisen darauf hin, dass der Wirt sich stärker belästigt fühlt.

Typen. — Holotype ♀ und Allotype ♂ in Leiden. Paratypen ♀ und ♂ in London, Paris, Washington, Hamburg, Antwerpen, Leningrad, Madrid, Nijmegen.

Abgrenzung gegenüber benachbarten Arten

In einer vorangegangenen Untersuchung (Lukoschus, Fain & Beaujean, 1967) wurden die bis dahin bekannten 17 Arten der Untergattung *Psorergates (Psorergates)* nach ihren Merkmalen in Gruppen einander nahestehender Arten zusammengefasst. Die Typenart der Familie *P. (P.) simplex* Tyrell (1883) konnte dabei nicht berücksichtigt werden, da die Beschreibung dafür nicht ausreichend ist und die Typenexemplare verloren gegangen sind.

In den Tabellen I und II sind die Messdaten von ♀ und ♂ der an Insektivoren parasitierenden Arten zusammengefasst. Fett und kursiv weisen dabei auf wichtige Determinationsmerkmale hin. Den Arten auf Insektivoren ist gemeinsam:

1. sehr kurze setae dorsal anterior auf den Tarsen;
2. vorn stark ausgebuchtetes Rückenschild;
3. alle Schildhaare deutlich vom Schildrande entfernt;
4. Gnathosomahaare gekerbt oder gelappt;
5. Terminalhaare beim Männchen auf einem längeren, stärker chitinisierten Sklerit.

Diese Merkmale unterscheiden die Arten von Insektivoren deutlich von den Arten, die Rodentia parasitieren. Die Arten *P. (P.) desmanae, talpae, crocidurae* und *sorici* können deshalb als Insektivoren-Gruppe innerhalb der Untergattung *Psorergates* sensu Fain (1961) zusammengefasst werden.

Die Gesetzmässig angeordneten dunklen Punkte auf dem Rückenschild verdienen weitere Beachtung. Es handelt sich dabei nicht um stark reduzierte Haare, wie sie bei den Arten *P. P. pitymydis* und *deomydis* beobachtet wurden.

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J. P. VAN LITH. — Contribution to the knowledge of Indo-Australian, South Pacific and East Asiatic Psenini. Genus Psen Latreille (Hymenoptera, Sphecidae), pp. 89—135, Figs. 1—44.

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CONTRIBUTION TO THE KNOWLEDGE OF INDO-AUSTRALIAN, SOUTH PACIFIC AND EAST ASIATIC PSENINI GENUS PSEN LATREILLE (HYMENOPTERA, SPHECIDAE)

by

J. P. VAN LITH

ABSTRACT

New species and subspecies of the subgenus *Psen* Latreille from the Indo-Australian and South Pacific regions are described: *aspites, nepalensis, sauteri, elisabethae madrasiensis, heinrichi, regalis, marjoriae, paulus paulus, paulus baduriensis, paulus subtilis, vadosus, bishopi, simlensis, sedlaceki.* Of a few species described earlier from only one sex the opposite sex was found. A new key is given for the subgenus *Psen,* now including species from Indo-Australia, the South Pacific Islands and East Asia. A new subgenus, *Punctipsen,* is erected to receive *P. exaratus* (Eversmann) of which a new subspecies, *exaratus indicus,* is described. A remarkable new species, *inflatus,* has been collected by the Third Archbold Expedition, 1938—1939, to New Guinea. It may belong to the subgenus *Mimesa* Shuckard, a taxon not yet recorded from Indo-Australia.

During the last few years a relatively great number of Psenini became available for study. Most of these Psenini were collected in the Indo-Australian and South Pacific area for the Bernice P. Bishop Museum, Honolulu. The directors of the museum of the Humboldt-University, Berlin, and of the Deutsches Entomologisches Institut, Eberswalde, had the kindness to send me their Psenini, including those collected by H. Sauter in Formosa (also his types) and by G. Heinrich in Celebes. Especially the forms from Celebes proved to be very interesting, some being strongly different from the other Indo-Australian *Psen* Latreille and *Psenulus* Kohl. The new species of *Psen* from Celebes are described in this paper; the genus *Psenulus* will be discussed in a future publication. Dr. G. R. Ferguson, Scarsdale, and the Rijksmuseum van Natuurlijke Historie, Leiden, obtained some good specimens from South India from P. S. Nathan, including a new subspecies of *Psen exaratus* (Eversmann), which is the first record of this species from Southern Asia. Through the kind intermediary of Prof. Dr. J. van der Vecht and Dr. V. Gupta I received some fresh material from North India.

Dr. C. R. Baltazar, Manila, and Dr. Henry K. Townes, Ann Arbor, sent me some Psenini from the Philippines and Japan. Our knowledge of the Psenini from New Guinea and Papua could be much improved, to which the material collected for the British Museum (Natural History) by Miss L. E. Cheesman has also contributed.

Important work has been done by Prof. Dr. K. Tsuneki, Fukui, Japan, who studied Sphecidae, including a number of Psenini, from the Ryukyus and Formosa. In my keys to the subgenera *Psen* and *Punctipsen* I have tried to include the species treated in his publications.

I express my gratitude to all these institutions and entomologists. Special thanks are due to Dr. K. V. Krombein for allowing me to study his material from Ambon, New Guinea and Papua, although he had originally reserved this for his own publications on Sphecidae from this region.

Now 65 species and subspecies of the subgenus *Psen* are known from East Asia and Indo-Australia. From Formosa, the Ryukyus and the South Pacific Islands 15 species and subspecies are added here, making a total of 80 (64 species and 16 subspecies). The subgenera *Punctipsen, Mimumesa, Mimesa, Pseneo* and *Odontopsen* count together 15 species and 9 subspecies. The extension of my study to the South Pacific Psenini revealed interesting close relationships between forms of the group of *P. elisabethae* occurring in the area from South India to Samoa.

The names of the institutions and entomologists are abbreviated as follows:

BISH — Bernice P. Bishop Museum, Honolulu
BM — British Museum (Natural History), London
BPIM — Bureau of Plant Industry, Entom. Research Section, Manila
Coll. Ferguson — Dr. G. R. Ferguson, Scarsdale, New York, U.S.A.
ML — Rijksmuseum van Natuurlijke Historie, Leiden
OUM — Oxford University Museum, Hope Department of Entomology, Oxford
Coll. Townes — Dr. Henry K. Townes and Dr. M. Townes, Ann Arbor, U.S.A.
UDE — University of Delhi, Department of Entomology, Delhi
USNM — United States National Museum, Washington D.C.
ZMB — Zoologisches Museum der Humboldt-Universität, Berlin

KEY TO THE INDO-AUSTRALIAN, SOUTH PACIFIC AND EAST ASIATIC SPECIES OF THE SUBGENUS *Psen* LATREILLE

1. Tarsi of fore legs of male laterally enlarged into a broad plate (fig. 1). Clypeus with broad and smooth ivory-white margin. Underside of head with long white hairs. Mesosternum short. Legs largely reddish; gaster including petiole reddish. Female unknown. (S. Celebes) ..... *aspites* sp. n.
— Fore tarsi of male without plate. Clypeus without ivory-white margin. Mesosternum longer 2
2. Female with long and pointed interantennal tooth (lateral view); pygidial area broadly triangular, densely punctate. Mid basitarsi of male broadened 3
— Interantennal tooth less strong. Basitarsus of mid legs of male normal 5
3. All tarsal segments of mid legs of male of abnormal shape. Face of female silvery; third antennal segment at most three times as long as it is broad at apex. Antennal segments 6—13 of male with tyloidea. (Europe, Siberia, China, Mongolia, Korea and Japan) ..... *ater*
— Only basitarsus of mid legs of male with hook-shaped protuberance 4
4. Antennal segments 6—12 (or 13) of male with tyloidea. Face of female golden; third antennal segment more than three times as long as it is broad at apex. (Japan) ..... *aurifrons*
— Antennae of male without tyloidea. Female unknown. (Japan) ..... *yasumatsui*
5. Posterior margin of gastral tergites with fringe of long hairs. 6
— No distinct fringe of long hairs 13
6. Back of propodeum in both sexes with irregular carination. Scape of antennae thick, further antennal segments normally slender. Pygidial area of female densely punctate. Antennae of male with tyloidea. Underside of petiole smooth in both sexes. Group of *P. emarginatus* 7

— Back of propodeum, especially of females, with parallel striation. Antennae thick, flagellum almost as broad as scape. Pygidial area of female broadly triangular, dull, an irregular row of punctures along the margin. Antennae of male without tyloidea. Underside of petiole irregular. Group of *P. curvipilosus* 11

7. Posterior margin of tergites with fringe of black hairs. Gaster black with bluish shine. Female unknown. (Malaya) ..... *pilosus*

— Fringe of hairs on posterior margin of tergites paler 8

8. First gastral tergite reddish-brown laterally. Posterior margin of tergites with fringe of long fuscous-golden hairs. Face of female pale golden. Length of female 13—14 mm, of male 11.5—12 mm. (Japan)..... *dzimm*

— No distinct red on first gastral tergite 9

9. Posterior margin of tergites with dense fringe of golden-brown, slightly bent hairs. Face of female pale golden. Length about 9 mm. Male unknown (E. Nepal) .... *nepalensis* sp. n.

— Hairs on posterior margin of tergites paler 10

10. Posterior margin of tergites with dense fringe of yellowish-grey long hairs. Disk of tergites with dense pubescence. Face of female golden. Length about 12 mm. Male unknown. (Formosa) ..... *sauteri* sp. n.

— Posterior margin of tergites with inconspicuous fringe of yellowish stiff hairs. Disk of tergites normally pubescent. Face of both sexes silvery. Length of female about 10 mm, of male about 8.5 mm. (Java, Borneo) ..... *emarginatus*

11. Curved long hairs along margin of gastral tergites and pubescence on disk of tergites golden-brown. Pubescence of face pale golden in both sexes. (Java) .... *curvipilosus*

— Curved hairs almost black, pubescence on disk of fourth, fifth and sixth gastral tergites greyish. Pubescence of face silvery 12

12. Hind tibiae brown. Larger. Punctures on second gastral tergite indistinct. In female end of petiole coarsely punctate ventrally, but punctures not deep. In male underside of petiole not or slightly concave on either side of median carina, very coarsely striato-punctate there. Carinae on either side of median ventral carina usually of irregular length. (Sumatra, Malaya, Formosa?) ..... *lieftincki lieftincki*

— Hind tibiae darker, nearly black. Smaller. Punctures on second gastral tergite more distinct but still fine. In female end of petiole below much finer punctate. In male underside of petiole concave on either side of median carina, few punctures only. Carinae on either side of median ventral carina usually of about equal length. (Malaya) ..... *lieftincki minor*

13. Mandibles extremely broad. Interantennal carina often ending in a transverse, much protruding carina. Pygidial area of female triangular, dull, an irregular row of punctures along the margin. In female, sometimes also in male, part of the longitudinal carinae of the enclosed area of the propodeum distinctly continued on to back of propodeum. Antennae of male probably always without tyloidea. Group of *P. tsunekii* 14

— Mandibles normal 19

14. Petiole more or less quadrate in cross section; sides depressed, consequently with distinct longitudinal edges above and below. Median ventral carina present 15

— Petiole rounded below and only upper lateral edges distinct or petiole almost cylindrical 16

15. Posterior end of petiole about 1 2/3 times as broad as base of petiole. Reticulate carination on back of propodeum rather coarse. Ventral median carina sharper. Puncturation of frons very fine but distinct, sparser on vertex. Female unknown. (Siberia) ..... *ussuriensis*
— Petiole more slender, sides almost parallel. Carination on back of propodeum less coarse. Frons and vertex almost impunctate. Ventral median carina of petiole of male weaker. Face of female silvery. (Japan) ..... *tsunekii*
16. Legs dark, tibiae brown. Frons and vertex with extremely fine puncturation. Back of propodeum with very coarse and irregular carination; a few of the longitudinal carinae of the enclosed area distinctly continued on to the back. Female unknown. (Assam) ..... *assamensis*
— Legs, at least tibiae, partly red 17
17. Only tibiae and tarsi reddish. Femora nearly black, underside brown. Antennae dark brown, underside paler, scape dark. Face of female golden. Male unknown. (Burma) ..... *vechti birmanicus*
— Legs completely or largely reddish 18
18. Scape of antennae reddish, also underside of flagellum. All legs, except trochanters, completely red. Sides of petiole finely punctate. Face of female golden. Male unknown. (Java) ..... *vechti vechti*
— Scape of antennae black with iridescent shine, flagellum slightly brownish. Fore and mid femora largely black. No tyloidea. Face of male silvery. Female unknown. (Formosa) ..... *shirozui*
19. Behind enclosed area of propodeum on both sides of median sulcus a smooth area, at most finely coriaceous. In case the smooth area is narrow and indistinct (cf. *P. politiventris* and *P. orientalis*) the dorsal side and back of propodeum forming an obtuse angle (cf. *P. refractus* if propodeum more or less smooth only dorsolaterally, behind enclosed area and second recurrent vein ending in third submarginal cell). Pygidial area of female (as far as known) with one row of punctures along margin 20
— No smooth or coriaceous area behind enclosed area of propodeum, near median sulcus; carinae on back of propodeum extending to enclosed area. Dorsal side and back of propodeum always curved in lateral view. Pygidial area of female densely punctate 63
20. Smooth (or coriaceous) areas behind enclosed area of propodeum broad, oblong, covering a large part of back of propodeum. Propodeum in lateral view usually gently curved, in some species somewhat angular. Second recurrent vein of fore wings never ending in third submarginal cell. Antennae of male without tyloidea 21
— Smooth areas narrower and for the greater part situated on the horizontal part of the propodeum. Propodeum in lateral view more angular, distinctly divided into an almost horizontal dorsal part and an almost perpendicular back part. Second recurrent vein of fore wings in some species ending in third submarginal cell 38
21. Pygidial area of female broadly triangular, surface coriaceous, one row of punctures along margin. Mesosternum with acetabular carina about as long as half the distance between the epicnemial carinae (in male even longer). Upper part of propodeum not coriaceous. Group of *P. nitidus* 22
— Pygidial area of female elongate triangular, smooth and shining. Acetabular carina

shorter (except in male of *P. coriaceus* and *P. heinrichi*). Group of *P. elisabethae* 23

22. Gaster, especially first tergite, finer and less densely punctate, pubescence sparser. Legs darker, in female hind tibiae only at knees and apices somewhat brownish. Length about 7.5—9 mm. (Java, Krakatau I., Bangka I., Sumatra, Ceylon, S. India) ..... *nitidus nitidus*

— Gaster somewhat stronger pubescent, especially on first tergite, also puncturation there slightly stronger. In female basal third of hind tibiae yellowish-brown. Length about 8—9.3 mm. (Formosa) ..... *nitidus takasago*

23. Margin of gastral tergites 2—5 impunctate, this margin broadest medially; in male at most a few minute piliferous punctures 24

— Only margin of fifth tergite impunctate, puncturation on tergites 2—4 almost reaching apical margin but sometimes very sparse 32

24. Petiole and legs including trochanters red 25

— Petiole black, also legs largely black or brown 28

25. Also first two gastral tergites red. Disk of first gastral tergite very sparsely punctate. Pubescence of face silvery, of head and thorax reddish-brown. Length about 10 mm; petiole about seven times as long as wide in the middle. Male unknown. (Solomon Is.) ..... *bishopi* sp. n.

— Gastral tergites black 26

26. Punctures of scutum relatively coarse, irregularly placed, partly almost contiguous in rows but interspaces often two or three times diameter of punctures. Scutum shining. Antennae entirely black or dark brown. Petiole brighter reddish. Face of female silvery, rest of body with greyish pubescence. Length about 6.5—11 mm, petiole about seven times as long as wide in the middle. (New Guinea, Papua) ..... *paulus paulus* sp. n.

— Punctures relatively finer. Usually larger species. Either scape of antennae reddish or face somewhat brassy. Petiole dark reddish 27

27. Scutum with somewhat leaden shine, puncturation fine and regular. Scape reddish. Pubescence of face silvery, of thorax golden-brown. Length about 9.5 mm, petiole about seven times as long as wide in the middle. Female unknown. (Solomon Is.) ..... *paulus subtilis* subsp. n.

— Puncturation fine on anterior part of scutum, coarser on posterior half. Scape of antennae dark brown. Face of female brassy, pubescence of scutum brownish. Length about 10—12 mm, petiole about seven times as long as wide in the middle. Male unknown. (New Guinea: Japen I.) ..... *paulus baduriensis* subsp. n.

28. Puncturation of frons and scutum very coarse (as in *P. coriaceus*). Post-ocellar area and frons raised. Smooth area of propodeum partly with coriaceous sculpture. Hind basitarsi at least dorsally black-brown, tibial spur of mid and hind legs white. Pygidial area narrow. Face silvery. Length about 10.5 mm, petiole about eight times as long as broad in the middle. Male unknown. (Philippines) ..... *marjoriae* sp. n.

— Puncturation of frons and scutum much finer. Hind basitarsi usually paler; tibial spurs yellowish-brown 29

29. All tarsi yellowish-brown, also apex of hind tibiae and pubescence of vertex and scutum brownish. Both recurrent veins of fore wings ending in second submarginal cell. Length about 9—12.5 mm, petiole about 6—7.5 times as long as wide in the middle. (New Ireland) ..... *novahibernicus*

— Tarsi yellowish-brown or darker, but pubescence of vertex and scutum whitish 30

30. Tarsi and apex of hind tibiae yellowish-brown as in *P. novahibernicus*. Enclosed area of propodeum hardly depressed and indistinctly separated from smooth parts of propodeum. Length about 8—9 mm, petiole about seven times as long as wide in the middle. (Solomon Is.) ..... *vadosus* sp. n.

— Tarsi more or less darkened, apex of hind tibiae dark. Enclosed area normally depressed 31

31. Tarsi of male darkened, of female largely testaceous. Fasciculate hairs of third and fourth gastral sternites of male brown. Genitalia of male large. Petiole about 7—8 times as long as wide in the middle. (Samoa) ..... *bryani*

— Tarsi of male testaceous, of female darkened dorsally. Fasciculate hairs of male yellow. Petiole about 7.5 times as long as wide in the middle. (New Hebrides) ..... *cheesmanae*

(I could not find any distinct difference in the puncturation of the scutum of *P. bryani* (♂) and *P. cheesmanae* (♀ and ♂) and am unable at the moment to distinguish between the females of these species).

32. Legs including trochanters red. Petiole dark reddish-brown, first and second gastral tergites laterally somewhat reddish-brown. Pronotal tubercles reddish. Face with appressed golden pubescence, frons and mesosternum with dense, short golden pubescence. Length about 12 mm, petiole 6.5—7.5 times as long as wide in the middle. Male unknown. (Solomon Is.) ..... *regalis* sp. n.

— At most tibiae and tarsi reddish, petiole black 33

33. Petiole about eight times as long as wide in the middle. Greater part of femora dark brown or black. Tibiae and tarsi reddish. Scape of antennae dark. Face silvery. Length about 8—10 mm. (Java, Sumatra) ..... *elisabethae elisabethae*

— Petiole about five or six times as long as wide in the middle. If petiole much longer, tibiae not reddish and carination on back of propodeum very coarse 34

34. Areas behind enclosed area of propodeum with fine but conspicuous coriaceous sculpture. Vertex raised. Puncturation of scutum very coarse. Inner side of fore tibiae and all tarsi testaceous (sometimes hind tarsi darkened). Spurs of mid and hind tibiae yellowish-brown. Length about 8—10 mm, petiole about six times as long as wide in the middle. (Philippines) ..... *coriaceus*

— No coriaceous sculpture. Puncturation of scutum finer 35

35. Vertex distinctly raised behind ocelli 36

— Vertex not distinctly raised 37

36. Puncturation of frons and scutum strong, frons and interocellar area raised. Carination on back of propodeum very strong. Tibiae dark brown, tarsi paler brown. Length nearly 12 mm, petiole 7—8 times as long as broad in the middle. Female unknown. (Celebes) ..... *heinrichi* sp. n.

— Puncturation much finer. Vertex raised behind ocelli. Tibiae reddish-brown, tarsi paler. Length about 9 mm, petiole about five times as long as broad in the middle. Male unknown. (Ambon I.) ..... *amboinensis*

37. Face silvery in both sexes. Pubescence of propodeum greyish. Pygidial area of female as in *P. elisabethae elisabethae*. Length about 9—10.5 mm, petiole about five times as long as wide in the middle. (S. India) ..... *elisabethae madrasiensis* subsp. n.

— Face of female with golden pubescence. Pubescence of propodeum brownish. Py-

gidial area of female slightly broader. Length about 9 mm, petiole about 5.5—6 times as long as wide in the middle. (Malaya, Pulau Tioman) ..... *elisabethae auricomus*

38. Second recurrent vein of fore wings ending well in third submarginal cell. Mandibles reddish except dark tips. Pygidial area narrow, smooth and shining, a few punctures along the margin. Petiole almost cylindrical. Group of *P. rufiventris* 39
— Second recurrent vein of fore wings interstitial or ending just in third submarginal cell. Mandibles mostly dark, often median part reddish-brown. Pygidial area of female triangular, surface finely reticulate, a few punctures along the margin; if the pygidial area is narrow, the surface is smooth or almost smooth. Petiole cylindrical or with lateral groove and ventral carina. Group of *P. orientalis* 44
39. Basal half of clypeus much raised, gaster red but petiole and first and third gastral tergites for the greater part brown-black. Face pale golden. Back of propodeum with whitish hairs. Male unknown. (S. India) ..... *rufiventris*
— Basal half of clypeus not much raised 40
40. Petiole red, remainder of gaster red or partly dark brown. Face of female silvery 41
— Petiole black, gaster completely black or first tergites somewhat reddish on the sides. Face of female golden 42
41. Gaster almost completely red, tergites only slightly darkened. Red band before anterior margin of clypeus. Male unknown. (W. Java) ..... *rubicundus rubicundus*
— Gaster much darkened, only apical margin and sides of second, third, fourth and fifth tergites ferruginous. Clypeus almost completely dark. Male unknown. (E. Java) ..... *rubicundus lawuensis*
42. Back of propodeum not only carinate but also punctate. Gaster completely black. Antennal segments 8—9 about twice as long as broad. Face including frons with dense golden pubescence. Back of propodeum with whitish hairs. Male unknown. (Luzon) ..... *nigriventris*
— Back of propodeum not punctate 43
43. Back of propodeum with whitish hairs. Face of female golden, of male silvery. Sides of gaster reddish. Antennae of female short, segments 8—9 about one and one-half times as long as they are broad. Antennae of male without tyloidea. (Japan) ..... *richardsi*
— Back of propodeum with golden-brown hairs. Face golden. Gaster completely black. Lower half of clypeus red. Frons angularly protruding, horizontal side of head long. Antennae long, no tyloidea. Smooth area behind enclosed area of propodeum indistinct. Female unknown. (Mindanao) ..... *angulifrons*
44. Pygidial area of female very narrow, almost gutter-shaped, shining. In female median part of clypeus distinctly raised, anterior margin with a deep triangular emargination. Tarsi red. Face with golden appressed pubescence. In male median part of clypeus not distinctly separated from lateral parts, tarsi dark brown and pubescence of face silvery. Antennal segments 4—13 with tyloidea. Both sexes without distinct smooth area behind the enclosed area of propodeum. Scutum with strong puncturation. Petiole cylindrical. (Java) ..... *terrigenus*
— Pygidial area of female slightly or much broader. Median part of clypeus of female less distinctly separated from the sides. Scutum finer punctate in both sexes, except in *P. triangulatus*. Face of female silvery or, if golden, pygidial area broad 45
45. Base of second gastral tergite of male with triangular, minutely reticulate area.

Scutum shining, with strong punctures in rows. Antennal segments 3—13 with tyloidea. Female unknown. (Java, Sumatra) ..... *triangulatus*

— No reticulate area on gaster (some males unknown) 46

46. Very long acetabular carina, nearly reaching epicnemial carina. Petiole without distinct ventral keel. Antennal segments 7—12 with subelliptic tyloidea. Female unknown. (Ryukyu Is.) ..... *hirashimai*

— Acetabular carina short or absent 47

47. Pygidial area of female very narrow, basal half somewhat convex and almost shining, apex emarginate, bilobed, lobes not much raised. Face of female silvery (for males see also couplet 52) 48

— Pygidial area broader, more flat and dull, apex almost straight (always?) and ends of lateral keels often distinctly raised into a blunt tooth 52

48. Petiole without lateral carinae. Anterior margin of clypeus protruding, slightly raised, with two triangular teeth. Legs dark. Male unknown. (N. India) ..... *simlensis* sp. n.

— Petiole in both sexes almost quadrate in cross section, sides with two distinct lateral keels 49

49. Smooth area behind enclosed area of propodeum (near median sulcus) narrow. Male with tyloidea on antennal segments 3—12 (on third segment incomplete). Length about 8.5—10 mm. (China, Tibet, Formosa) ..... *hakusanus seminitidus*

— Larger forms 50

50. Pygidial area narrower. Puncturation of scutum finer. Smooth area behind enclosed area of propodeum broad. Third antennal segment of female 3.2 times as long as broad at apex, fourth segment almost twice as long as broad. In male antennal segments 3—10 or 3—11 with tyloidea (on third segment incomplete). (Japan) ..... *hakusanus hakusanus*

— Pygidial area slightly broader. Puncturation of scutum stronger 51

51. Puncturation of scutum remote, stronger than in *P. hakusanus hakusanus*. Area behind enclosed area of propodeum smooth. Third antennal segment 2.7, fourth segment 1.8 times as long as broad at apex. Length about 12—13 mm. Male unknown. (Korea) ..... *koreanus koreanus*

— Puncturation of vertex and scutum finer than in preceding subspecies but still stronger than in *P. hakusanus hakusanus*. Area behind enclosed area of propodeum with fine longitudinal striation. Third antennal segment three times, fourth segment twice as long as broad at apex. Length about 11.3 mm. Male unknown. (Formosa) ..... *koreanus formosensis*

52. Scutum with plumbeous hue, very finely punctate. Petiole in both sexes rounded above, in female with lateral depression and two lateral edges, ventral keel not sharp. Frons of female finely punctate. Antennal segments 5—6 of male with tyloidea. Third and fourth gastral sternites of male with fasciculate hairs. (India) ..... *orientalis*

— Scutum with much stronger punctures 53

53. Petiole distinctly quadrate in cross section with sharp ventral keel and normally punctate scutum. Antennal segments 5—6 of male with tyloidea. Face silvery in both sexes. 54

— Petiole without distinct ventral keel. Antennae of male without tyloidea or segments 3—9, 3—12, 4—10 or 4—12 with narrow carina (not all males known) ... 55

54. Frons below ocelli with punctato-striate sculpture. Vertex and scutum finely but distinctly punctate. (Ussuri region, Japan, Korea) ..... *affinis affinis*
— Frons below ocelli stronger striate. Vertex and scutum slightly stronger punctate. Pygidial area of female slightly broader. Smooth area behind enclosed area of propodeum of female slightly broader. In female carination of propodeum stronger. (China) ..... *affinis grahami*
55. Legs dark, at most tarsi reddish or reddish-brown 56
— Femora and tibiae or tibiae and tarsi red. Face of female golden pubescent 60
56. Petiole short, less than twice as long as first gastral tergite, sides depressed. Pygidial area of female rather broad, with irregular, basally double row of punctures. Face silvery. Fore and mid tarsi reddish. Male unknown. (S. China) ..... *kulingensis*
— Petiole longer, cylindrical 57
57. Face of female silvery. Pubescence of scutum brownish. Most antennal segments about twice as long as broad in the middle, segments 4—12 with tyloidea. Third and fourth gastral sternites of male with fasciculate hairs. (India) *fuscinervis*
— Face of female golden (female of *P. longicornis* Tsuneki unknown). In male antennal segments without tyloidea or segments 3—9 with tyloidea or segments longer 58
58. Scutum with close and strong puncturation. Behind enclosed area a broad smooth margin. Pubescence of scutum brownish. Apex of pygidial area emarginate. In male antennae without tyloidea and only fourth gastral sternite with fasciculate hairs. (Burma) ..... *yomasanus*
— Scutum with finer puncturation. Smooth margin behind enclosed area narrower. Pubescence of scutum greyish. Antennae of male with tyloidea 59
59. Apex of pygidial area of female truncate. Puncturation of scutum anteriorly with fine and close puncturation, posteriorly more coarsely punctate. Petiole subcircular or subquadrate, laterally at most weakly furrowed. In male antennal segments 3—9 with tyloidea; fourth gastral sternite only with fasciculate hairs. (Formosa) ..... *alishanus*
— Female unknown. Petiole roughly quadrangular in cross section, laterally with broad furrow margined by carinae. Antennal segments long, 3—12 with tyloidea; third and fourth gastral sternites with fasciculate hairs. (Formosa) *longicornis*
60. Legs including trochanters pale red, tarsi somewhat darkened, also lower outer side of fore femora. Temples and thorax with whitish hairs. Frons below ocelli striato-punctate. Petiole reaching beyond hind femora. Antennal segments 4—10, rarely 4—11 of male with narrow tyloidea. (Luzon) ... *politiventris politiventris*
— Outer side of fore femora entirely darkened or all femora darkened 61
61. Legs red, only outer side of fore femora darkened. Pubescence on vertex, thorax and gaster golden-brown. Frons below ocelli strongly striato-punctate. Petiole reaching beyond hind femora. Male unknown. (Mindanao) ... *politiventris bellus*
— Femora brown or black. Hairs on propodeum whitish 62
62. Femora brown, tibiae and tarsi pale red. Sides and back of thorax with whitish hairs. Frons below ocelli finer punctate than in nominate form, interspaces somewhat opaque. Petiole not reaching as far as hind femora, cylindrical. Punctures of pygidial area somewhat larger than in nominate form. Male unknown. (Malaya) ..... *politiventris pahangensis*

— Femora black, apices of femora, entire tibiae and tarsi ferruginous to reddish-yellow. Petiole with distinct lateral furrow bordered on both sides by carinae. Antennae of male without tyloidea. Gastral sternites 3—4 of male with fasciculate hairs. (Formosa) ..... *tanoi*

63. Scutum except at the sides coarsely striato-punctate or with very strong punctures. Interantennal tooth reduced to a flat round tubercle 64

— Scutum shining, with normal puncturation 65

64. Scutum with strong punctures and also longitudinally striate. Legs reddish. Pygidial area of female triangular, with large punctures. Antennal segments 6—13 of male with broad tyloidea. Face of female golden, of male silvery. (Philippines) ... *bakeri*

— Scutum with stronger punctures, interspaces often less than width of one puncture; a few longitudinal striae. Legs, petiole, first gastral tergite and second tergite except dark margin, reddish. Antennal segments 6—13 of male with tyloidea. Face of male silvery. Female unknown. (New Guinea) ..... *sedlaceki* sp. n.

65. Second recurrent vein of fore wings ending in third submarginal cell. Median anterior part of clypeus of female strongly raised and separated from the depressed lateral parts by a sharp edge. Antennae of male with broad tyloidea. Group of *P. refractus* 66

— Second recurrent vein of fore wings interstitial or ending in third submarginal cell. Median part of clypeus of female not separated from the lateral parts by a sharp edge (a short carina in *P. ruficrus*) 69

66. Petiole of female without distinct lateral carinae or groove. Raised part of clypeus short. Only hind margin and sides of first tergite and sides of second and third tergite reddish, in both sexes. Face of female silvery. No smooth area on propodeal declivity. (Ceylon) ..... *matalensis*

— Petiole of female with distinct lateral groove. Raised part of clypeus long. In *P. refractus* (both sexes) propodeum with an almost smooth dorso-lateral area behind enclosed area 67

67. Face of female golden. Only sides of first gastral tergite somewhat reddish. Pygidial area of female broader, less densely punctate. Fifth and sixth antennal segments of male about twice as long as broad. (S. India) ..... *krombeini*

— Face of female silvery. First or first and second gastral tergites red. Pygidial area of female narrower, more densely punctate 68

68. First and second gastral tergites red. Male unknown. (India) ... *refractus refractus*

— First gastral tergite red, second tergite with lateral red spots. Fifth and sixth antennal segments of male about as long as broad. (S. India) *refractus meridianus*

69. Gaster including petiole black 70

— Petiole red; if black, following segments at least partly red 74

70. Interocellar and postocellar areas distinctly raised. Antennal segments 6—13 of male with broad tyloidea. No acetabular carina. Second recurrent vein of fore wings interstitial. Face of male silvery. Female unknown. Legs dark. (Philippine Is.) ..... *melanosoma*

— Interocellar and postocellar areas not or only slightly raised. Antennal segments 6—12 or 7—12 of male with tyloidea (male of *P. opacus* unknown) 71

71. Second recurrent vein of fore wings ending well in third submarginal cell. Propodeum behind enclosed area with fine, more or less parallel carinae. Pygidial area of female broadly triangular, with four or six longitudinal rows of punctures. Face of female silvery. 72

— Second recurrent vein of fore wings interstitial. No parallel carinae behind enclosed area 73

72. Legs dark. Second recurrent vein of fore wings ending well in third submarginal cell. Male unknown. (Philippine Is.) ..... *opacus opacus*

— Legs partly ferruginous. Second recurrent vein of fore wings ending close to base of cell. Male unknown. (Ryukyu Is.) ..... *opacus gressitti*

73. Propodeum on both sides behind enclosed area not smooth but with some indistinct carinae and irregular tubercles. Antennal segments 6—12 of male with tyloidea. Female unknown. (Morotai) ..... *carbonarius*

— Propodeum behind enclosed area in male with normal carination, in female much finer. Pygidial area of female broad with many large punctures, margin impunctate. Antennal segments 7—12 of male with oval tyloidea. Face of female golden, of male silvery. (Java) ..... *betremi*

74. Petiole and following two or three tergites red. Legs red. Interocellar and postocellar areas much raised. Pygidial area of female striato-punctate, margin dull and impunctate. Face of female golden, of male silvery, rest of body with golden-brown pubescence. Length of female about 12—13 mm, of male about 11 mm. (Celebes) ..... *toxopeusi*

— Petiole red but no tergites fully red or petiole black and at least second tergite entirely or almost entirely red. Smaller species 75

75. Petiole black, gastral tergites 1—4 for the greater part red. Second recurrent vein of fore wings ending well in third submarginal cell. Interocellar and postocellar areas not much raised 76

— Petiole black or red, at most two gastral tergites entirely or partly red. Second recurrent vein mostly interstitial 77

76. Face of female silvery. Mesosternum, coxae and femora conspicuously silvery pubescent. Red: gastral tergites 1—4 entirely, fifth tergite partly and sternites 2—3 entirely; legs reddish brown but femora partly darkened. Pygidial area of female broadly triangular, densely and coarsely punctate, also medially, margin reticulate. Male unknown. (Malaya) ..... *brinchangensis*

— Face of female golden. Red: gastral tergites 1—4, first, third and fourth tergites partly darkened, and sternites 2—4. Legs also red, fore and mid femora darkened posteriorly. Pygidial area broadly triangular, coarsely punctate with a narrow median impunctate line. Male unknown. (N. India) ..... *eurypygus*

77. First and second gastral tergites red. Petiole black. Second and following gastral tergites with conspicuous short white pubescence, hairs longer and somewhat curved backwards at hind margins. Face of female silvery. Pygidial area of female rather broadly triangular, densely punctate, margin impunctate. Male unknown. (N. India) ..... *rufoannulatus*

— Gaster darker, petiole black or red 78

78. Petiole black. First gastral tergite of female with red apical margin, second gastral tergite with two lateral spots; male with more red on these tergites and on following segments. Interocellar and postocellar areas much raised. Second recurrent vein of fore wings about interstitial. Pygidial area of female densely and almost fully striato-punctate. Antennal segments 6—13 of male with broad tyloidea. Face golden in both sexes, rest of body golden-brown. (Luzon) ..... *aureohirtus aureohirtus*

— Petiole red 79

79. Gaster slightly darker but otherwise as in preceding form. Female unknown. (Negros) ..... *aureohirtus rufopetiolatus*

— Gastral tergites black. Interocellar and postocellar areas not much raised. Second recurrent vein of fore wings usually interstitial. Antennal segments 6—13 of male with tyloidea. Pygidial area of female broadly triangular, with many large punctures. Legs pale red. Face of female golden, of male silvery. (N.E. New Guinea and Papua) ..... *ruficrus*

Psen (Psen) ater (Fabricius)

1794, Fabricius, Entom. Syst. 4: 457 (*Sphex atra*).

In the material of the museum of the Humboldt University, Berlin, I found two females from Manchuria: Harbin, 25—30 June 1935, collected by V. Kardoff.

The genitalia of the male of *P. ater* are relatively large, the stipites are ear-shaped, without inner membranous lobes: fig. 34—35 (undated specimen, probably from Europe).

Psen (Psen) aspites spec. nov.

Male. — Head and thorax black, scutum with steely reflection, back of propodeum with bronze gloss. Mandibles with dark red tips. Anterior margin of clypeus (about one third) and labrum ivory-white. Palpi testaceous. Scape of antennae dark yellow, following segments yellowish-red, segments 5—11 partly black on underside and last segment almost completely black. Humeral tubercles yellowish-white. Legs reddish, including coxae and trochanters; some parts of fore legs yellowish-white: trochanters, underside of femora, ends of tibiae and the first four, broadened, tarsal segments except outer tips which are black. Gaster including petiole reddish.

Clypeus smooth and shining, anterior margin with a slight emargination. Anterior margin of labrum almost straight. Frontal carina ending below in a slightly thicker part, no distinct tooth. Frons immediately above the antennae shining somewhat depressed to receive the heavy scapes, rest of frons and vertex with fine and remote puncturation. Mandibles normal. Scape of antennae at least one and one-half times as broad as the broadest part of flagellum. Third antennal segment about three times as long as broad, ventrally with a deep longitudinal depression, fourth segment about as long as broad, following segments much shorter than broad, last segment pointed. Segments 4—13 strongly concave ventrally and with sharp sides.

Scutum and scutellum with fine and remote puncturation. Enclosed area of propodeum of normal type, median two longitudinal carinae diverging. Behind this area propodeum on both sides somewhat raised and with some fine carination, back of propodeum medially depressed, with rather fine reticulate carination, on either side of the very narrow longitudinal sulcus the carinae are partly transverse and parallel. Sides of propodeum, metapleura and mesopleura smooth and shining, hypo-epimeral area distinct. Underside of epicnemial area receding backwards, consequently mesosternum short and fore and hind margins of mesopleura parallel. Fore legs of unusual shape; trochanter nodiform, femur much broadened, underside flattened into a triangle with an angle of about 120 degrees, apical half of tibia somewhat broadened, tarsal segments 1—4

enlarged, forming a large thin shield on outer side (fig. 1). Mid tibiae broadened medially. Second recurrent vein of fore wings ending in third submarginal cell. Petiole cylindrical, reaching about as far as end of femora. Gaster with minute and remote puncturation, second sternite on base with a few larger punctures.

Upper part of clypeus and supra-clypeal area with silvery appressed pubescence, also frons below ocelli on either side with a ring of apressed silvery hairs enclosing a bare shining spot. Basal half of mandibles with long white hairs. On both sides of hypostoma a patch of long white hairs like a beard. Temples with short silvery pubescence. Vertex with long yellowish-grey hairs. Pronotum, lower part of epicnemial areas, mesosternum and mesopleura with short silvery pubescence. Scutum and propodeum with long, yellowish-grey pubescence. Shield of fore tarsus with fringe of fine long and pale hairs. Gaster with sparse pubescence, a few long hairs near the margin of the sternites. Apical margin of sternites 3—4 with golden fasciculate hairs, in two bundles on each sternite.

Length about 9 mm.

Female unknown.

S. Celebes: 1 ♂ (holotype), Talassa (Maros) 300 m, Oct. 1931, coll. G. Heinrich (ZMB).

This is the first *Psen* known to me with so much enlarged fore tarsi. They remind of the tarsal shield of some Crabronidae. The ivory-white margin of the clypeus is also peculiar. In view of some other characters, such as the course of the epicnemial carinae, the frontal carina and the fasciculate hairs on the gastral sternites, I have provisionally placed this wasp in a separate group of the subgenus *Psen*. To avoid the risk of irreparable damage I have not examined the genitalia of this valuable specimen.

P. petiolatus Smith of which only the holotype (a female collected in 1864 in Misool or Celebes) is known, appears to be very similar. But according to the notes I made when examining this specimen it has distinct inner epicnemial carinae and acetabular carina and no recurved outer epicnemial carinae, so that I am rather inclined to place it in the subgenus *Mimumesa*.

Group of *Psen emarginatus*

Representatives of this group were already known from Malaya, Java and Japan. *P. emarginatus* from Java is now also found in Borneo.

The area of distribution of the group was further extended by two new species from Nepal and Formosa. They are all closely related, the differences being mostly in the colour of the gastral fringes and of the clypeal pubescence.

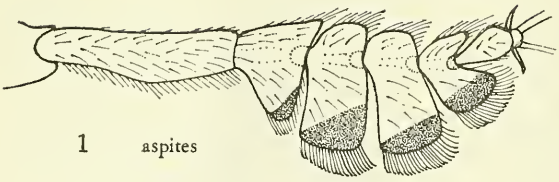
Psen (Psen) emarginatus Van Lith

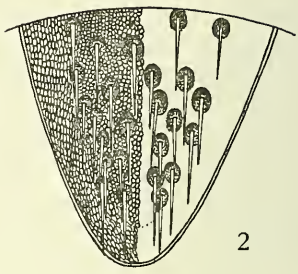
1959, Van Lith, Zool. Verh. Leiden 39 : 43—44 (Java).

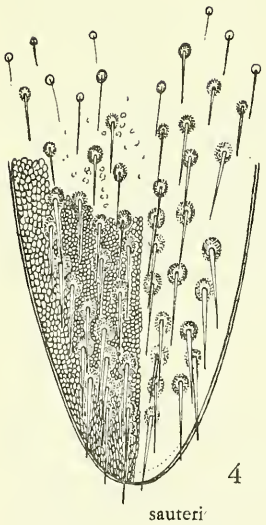
New record: 1 ♀, British N. Borneo, Mt. Kinabalu, Kambaranga, 2140 m, 22—30 Oct. 1958, coll. T.C. Maa (BISH).

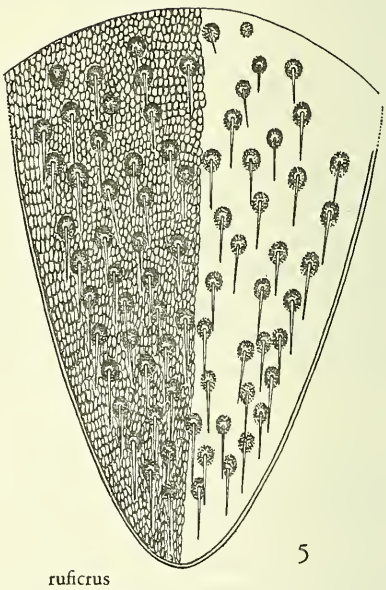
This is the first record of the genus *Psen* from Borneo. The wasp was collected together with its prey, an Issid (Homoptera). As far as I can see it is not different from the females from Java.

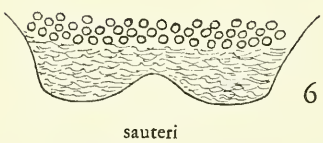
Pygidial area of one of the paratypes (female) from Central Java is depicted on fig. 3.











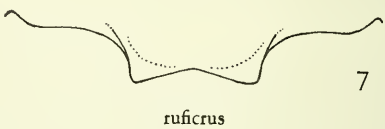


Fig. 1—7. Species of Indo-Australian *Psen* s.str. 1, fore tarsus of *P. aspites* sp.n., ♂; 2—5, pygidial area of female; 2, *P. nepalensis* sp.n.; 3, *P. emarginatus* Van Lith; 4, *P. sauteri* sp.n.; 5, *P. ruficrus* Van Lith; 6—7, anterior margin of clypeus; 6, *P. sauteri* sp.n.; 7, *P. ruficrus* Van Lith.

Psen (Psen) nepalensis spec. nov.

Female. — Black; outer half of mandibles dark red, palpi yellowish-brown, underside of antennae dark brown. Tarsi brown. Tibial spurs of hind legs yellowish-white. Veins of wings and tegulae dark brown.

Protruding median part of clypeus with rounded emargination. Disk of clypeus regularly convex, densely punctate, margin impunctate. The interantennal carina ends between the antennae in a short tooth, indistinctly connected with the antennal sclerites by a fine carina. Frons coarsely punctate with narrow, shining interspaces, on the upper part against the eyes an elliptic, slightly raised, almost impunctate area, vertex sparsely punctate but more strongly and denser behind the ocelli. Mandibles normal. Antennae long, third segment about five times as long as it is broad at the apex, segments 4—6 more than twice as long as broad, segments 7—11 less than twice as long as broad, gradually shorter, last segment about twice as long as it is broad at the base.

Scutum with strong punctures, these sometimes in rows, but interspaces mostly greater than diameter of punctures. Puncturation of scutellum and metanotum much more widely spaced. Enclosed area of propodeum depressed, shining, with longitudinal carinae, median two slightly diverging and with some irregular carination in between. Back of propodeum with coarse irregular carination, which is finer just behind the enclosed area. A bent carina separates the back of the propodeum from the sides which show some fine rugae and sparse fine punctures on their posterior half. Mesopleura sparsely and finely punctate, posterior margin smooth, metapleura entirely smooth. Back of hind femora with median longitudinal line of extremely fine punctures with short hairs. Above this line the posterior surface of the femora is completely smooth and shining, lower half shining with a few long hairs. Mid tibiae normal. Hind tibiae with a row of white spines. The first recurrent vein of the fore wings ends well in the second submarginal cell, the second recurrent vein ends about half this distance into the third submarginal cell.

Petiole nearly flat above, rounded below, sides with sharp longitudinal edge above from base to end and a shorter one below on the apical half. Gaster finely but distinctly punctate, second tergite laterally at base much coarser. Pygidial area broadly triangular with rounded apex, surface with fine reticulate sculpturation, median part somewhat convex and with rows of large punctures which are open towards the rear. Broad margin of pygidial area without punctures, also the narrow median line is impunctate (fig. 2).

Face with very pale golden pubescence and a number of long, erect whitish hairs. Pubescence on upper side of head and body brownish, whitish on ventral side. Pubescence of gastral tergites, especially of third and fourth tergites, dense and long. Posterior margin of tergites with dense fringe of golden-brown, slightly bent hairs. Pygidial area and sides of last tergite with stiff hairs, directed backwards.

Length about 9 mm.

Male unknown.

East Nepal: 1 ♀ (holotype), Taplejung distr. above Sangu, 6500 feet, evergreen scrub, 5—13 Oct. 1961, R. L. Coe, E. Nepal Expedition 1961—1962, BM 1962—177 (BM).

This wasp belongs to the group of *P. emarginatus* and resembles the equally strongly pubescent Japanese species *P. dzimm,* from which it differs in the darker first gastral

tergite and legs and in the smaller size. There is also some difference in the relative length of the antennal segments. Further studies of both sexes are necessary to ascertain the relationship between the two forms.

The Javanese *P. emarginatus* is much less densely pubescent and the fringes on the hind margin of the tergites are less conspicuous. The tibial spurs of the fore and mid legs are whitish with a small brown apex, whereas in *P. nepalensis* these spurs are completely yellowish-white. There is no important difference between the pygidial areas of *P. nepalensis* and *P. emarginatus* (fig. 2 and 3). The punctures of *P. emarginatus* are larger and they are more in longitudinal rows whilst the irregular longitudinal impunctate areas are slightly raised.

P. sauteri from Formosa is larger, the pubescence is paler and its antennal segments are longer.

In *P. pilosus* from Malaya the fringes on the hind margin of the tergites are black.

Psen (Psen) sauteri spec. nov.

Female. — Black, gaster with bluish shine; median part of mandibles yellowish-red, outer tips dark red, anterior margin of clypeus reddish transparent, labrum paler red, underside of antennae brown, palpi testaceous. Tegulae reddish-brown. Femora dark brown, fore side of fore and mid tibiae and base of hind tibiae paler brown, tarsi yellowish-brown but hind tarsi darkened dorsally, tibial spurs yellowish-brown. Veins of wings brown.

Protruding part of clypeus with triangular emargination (fig. 6). Surface of clypeus densely punctate, impunctate margin with fine transverse striation. Interantennal carina ending between antennae in a distinct tooth, which is connected with the underside of the antennal sclerites by a distinct carina. Frons below ocelli densely and coarsely punctate, on the upper part against the eyes an elliptic, slightly raised, impunctate area. Vertex finely and sparsely punctate, interocellar area somewhat denser punctate. Mandibles normal. Antennae long and slender, third segment more than five times as long as broad at apex, fourth and fifth segments about three times as long as broad, segments 6—8 twice as long as broad, segments 9—11 nearly twice as long as broad, last segment more than twice as long as it is broad at base.

Scutum with coarse punctures, often in rows, interspaces mostly smaller than diameter of punctures, or as large as diameter of punctures, on central part of scutum a few rugae with rows of punctures. Puncturation of scutellum and metanotum much finer and sparser. Enclosed area of propodeum rather long, with longitudinal carinae. Posterior half of median two carinae somewhat diverging, basal half between these carinae finely irregularly carinate. Back of propodeum somewhat rounded in lateral view with coarse reticulate carination which is finer just behind enclosed area, anterodorsolaterally a small, almost smooth area. A bent carina separates the back of the propodeum from the sides, which have a few short carinae and are finely punctate on the posterior part. Mesopleura with sparse and fine puncturation, mesosternum with fine and dense puncturation, metapleura smooth. Back of hind femora smooth, with longitudinal line of fine piliferous punctures. Mid tibiae slightly bent but not much thickened; a row of four long yellowish thorns on outer half and two slightly shorter thorns at apex, basitarsus about four times as long as broad with a comb of five long spines. Hind tibiae with a row of short brownish thorns. The first recurrent vein of the

fore wings ending well in the second submarginal cell, second recurrent vein ending about half this distance into third submarginal cell.

Petiole flattened on posterior dorsal half, sides flattened but without sharp carinae. Gaster densely and finely punctate, second tergite at base laterally coarser, narrow apical margin densely punctate. Pygidial area (fig. 4) broadly triangular with rounded apex, surface with fine coriaceous sculpture and with about six irregular rows of large punctures; margin impunctate, also base medially where sculpture is finer. Second gastral sternite with dense and rather strong puncturation, median part somewhat depressed and shining, with only a few punctures on its basal half, also base of this tergite impunctate. Median part of ventral disk of first sternite (petiole) impunctate. Hind margin of gastral sternites 3—5 impunctate. Last sternite with smooth keel on apical half.

Face with beautiful golden, appressed pubescence and a few long, whitish, erect hairs. Pubescence on vertex and on dorsal side of thorax light brown. Temples, dorsal side of pronotum, mesosternum and underside of legs with silvery-white pubescence. Propodeum with long whitish hairs. Gastral tergites 1—5 with yellowish-grey, dense and soft pubescence, these hairs partly rather long, hind margins of tergites with a dense row of longer yellowish hairs, directed backwards and with bent tips. Pygidial area and sides of last tergite with long, backwards-directed bristle-hairs.

Length about 12 mm.

Male unknown.

Formosa: 1 ♀ (holotype), Taihorin, Aug. 1910, coll. H. Sauter (ZMB).

P. sauteri differs from *P. dzimm* Tsuneki (Japan) in the dark first tergite and paler apical fringes of the tergites, from *P. emarginatus* Van Lith (Java and Borneo) in the denser pubescence and golden face, and from *P. nepalensis* Van Lith (E. Nepal) in the paler fringes, longer antennal segments and denser puncturation of the scutum. *P. pilosus* Van Lith (Malaya) has black apical fringes of the tergites.

Group of *Psen tsunekii*

Psen (Psen) shirozui Tsuneki

1966, Tsuneki, Etizenia Fukui Univ. 14 : 10—11 (Formosa).

Tsuneki placed this species in the group of *P. tsunekii* Van Lith. It is indeed closely related to *P. vechti* Van Lith, also in regard to the structure of the propodeum. Both forms have small transverse depressions at the posterior margin of the enclosed area of the propodeum, which are deeper than the parts of the enclosed area between the longitudinal carinae. In the description of *P. vechti* this remarkable character was omitted. The longitudinal carinae of the enclosed area pass between these transverse depressions, continuing on to the back of the propodeum. In *P. vechti* they are very regular, parallel, surpassing the central part of the back. In *P. shirozui* the carinae seem to be shorter and less parallel, but of this species only the male being known and of *P. vechti* only the female, it is uncertain whether this is a matter of sexual difference.

Group of *Psen nitidus*

Psen (Psen) nitidus nitidus Van Lith

1959, Van Lith, Zool. Verh. Leiden 39 : 28—30.

P. nitidus was first recorded from Java, Bangka and Krakatau, moreover one female was mentioned from Ceylon. Its occurrence in S. India is now well confirmed, nine

specimens having been collected there. The discovery of two females, collected in C. Sumatra is therefore not surprising. I could not find any important difference between the Indian and the Indonesian material, except some variation in the colour of the legs. The base of the hind tibiae, however, is not as pale as in the subspecies from Formosa. In the female from Cinchona the median two carinae of the enclosed area are less diverging so that the area in between is narrower, but probably this is a deformation.

The genital apparatus of the Indian male agrees with that of the Indonesian specimens.

New records from S. India: 2 ♀ and 1 ♂, Kerala State, S. Malabar, Walayar Forests, 1000 ft., Sept.-Oct. 1955/1956, coll. P. S. Nathan (Coll. Ferguson); 1 ♀, Walayar Forests, 700 ft., Oct. 1959; 2 ♂, Madras State, Nilgiri Hills, Devala, 3200 ft., Oct.-Nov., 1960; 2 ♂, Madras State, Anamalai Hills, Kadamparai, 3500 ft., May 1963; 1 ♀, Anamalai Hills, Cinchona, 3500 ft., May 1960, all coll. P. S. Nathan (ML).

Northeast Sumatra: 2 ♀, Bandar Baru, 30 May 1912, coll. Buttel-Reepen (ZMB).

Psen (Psen) nitidus takasago Tsuneki

1967, Tsuneki, Etizenia Fukui Univ. 24 : 8—9.

Tsuneki considers this form from Formosa as a subspecies. The bases of the hind tibiae of the female are yellowish-brown (dark brown in the nominate subspecies) and the pubescence, especially on the first gastral tergite, is somewhat denser, the puncturation on this tergite being slightly stronger than in the nominate subspecies.

The differences are, however, very small and the colour of the base of the hind tibia of the female is variable.

New records from Formosa: 1 ♀, Oct. 1910, and 4 ♂, April and Sept. 1910, Taihorin, coll. H. Sauter (ZMB).

Group of *Psen elisabethae*

P. elisabethae (Java) and a closely related species, *P. coriaceus* (Philippine Is.), were described in 1959. They are characterized by the smooth areas of the propodeum and the shining, elongate-triangular pygidial area of the female. The antennae of the males have no tyloidea. Later I found that the genital apparatus of the male of *P. elisabethae* is distinctly different from that of the other species of the subgenus *Psen*.

In the course of subsequent studies I recognized at least fourteen more forms which should be placed into this group. The group has a very extended area of dispersal but the differences between the species are still relatively slight. At the moment they are known to occur from India to Samoa, and from the Philippine Is. to Java. It is one of the most important groups of species in the Indo-Australian and Pacific region and certainly the most interesting one. A number of islands are still to be explored and also the southeastern part of continental Asia. I expect that collectors on future expeditions will discover a great many new forms which will enable us to draw more reliable conclusions in regard to the specific or subspecific status of the forms described so far.

Psen (Psen) elisabethae Van Lith

A male collected in Viet-Nam, Mt. Lang Bian, 1500—2000 m, 19 May—8 June 1961, in a Malaise trap by N. R. Spencer (BISH), could not yet be classified satisfactorily. It may be a new subspecies.

Psen (Psen) elisabethae auricomus Van Lith

1965, Van Lith, Zool. Verh. Leiden 73 : 31 (Malaya, Pulau Tioman).

A drawing (fig. 9) of the pygidial area of one of the paratypes (♀) is given here to complete the original description.

Psen (Psen) elisabethae madrasiensis subspec. nov.

1965, Van Lith, Zool. Verh. Leiden 73 : 31—32 (*P. elisabethae* subsp.).

In 1965 I briefly mentioned a female of *P. elisabethae* subsp. from S. India. The study of another female and two males from the same region has proved that the S. Indian form is indeed quite different from the nominate subspecies.

The S. Indian specimens are easily distinguished from the nominate subspecies by the much shorter petiole and the heavier legs. In this respect they resemble *P. amboinensis* in which, however, the median part of the vertex is much more raised while the puncturation of vertex and scutum is weaker; moreover the pygidial area of the female of the latter is broader (fig. 10). In *P. elisabethae madrasiensis* the pygidial area (fig. 11) resembles that of the nominate subspecies (fig. 8).

Female. — First two antennal segments reddish (in the Javanese specimens these parts usually almost completely very dark brown). Base of flagellum ventrally reddish or brown. Legs darker than in the nominate form but fore side of fore femora and apices of all femora reddish-brown; mid and hind tibiae partly, mostly on fore side, dark brown, also thorns on outer side of hind tibiae dark. Fore tibiae almost completely red (in *P. elisabethae auricomus* from Malaya on the contrary, the legs are paler than in the nominate subspecies, the femora being also reddish or reddish-brown).

Puncturation of vertex stronger, median part only slightly raised. Puncturation of tergites, notably of second tergite somewhat finer, but still distinct and reaching to outer apical margin. Petiole much shorter, about five times as long as broad in the middle, the basal part before the bend about one third of total length, in the nominate form approximately one-fourth of total length.

Pubescence of face silvery (in *P. elisabethae auricomus* pubescence distinctly golden).

Length about 10.5 mm.

Male. — Underside of antennae more brown. Legs much more slender than in female. Easily distinguished from nominate subspecies by shorter petiole.

Length about 9 mm.

South India: 1 ♀ (holotype), Madras State, Nilgiri Hills, 3500 ft., coll. H. L. Andrews (OUM); 2 ♂ (allotype and paratype), Madras State, Anamalai Hills, Cinchona, May 1959, coll. P. S. Nathan (Coll. Ferguson); 1 ♀ (paratype), Madras State, Anamalai Hills, Kadamparai, 3500 ft., May 1963, coll. P. S. Nathan (ML).

Psen (Psen) amboinensis Van Lith

1965, Van Lith, Zool. Verh. Leiden 73 : 32—33.

The third known female, recorded here, seems to confirm the constancy of the characters mentioned in the original description. This strengthens my opinion that the present form represents a distinct species, closely related to *P. elisabethae* s.str.

Ambon I.: 1 ♀, Oct. 1949, coll. M. A. Lieftinck (ML).

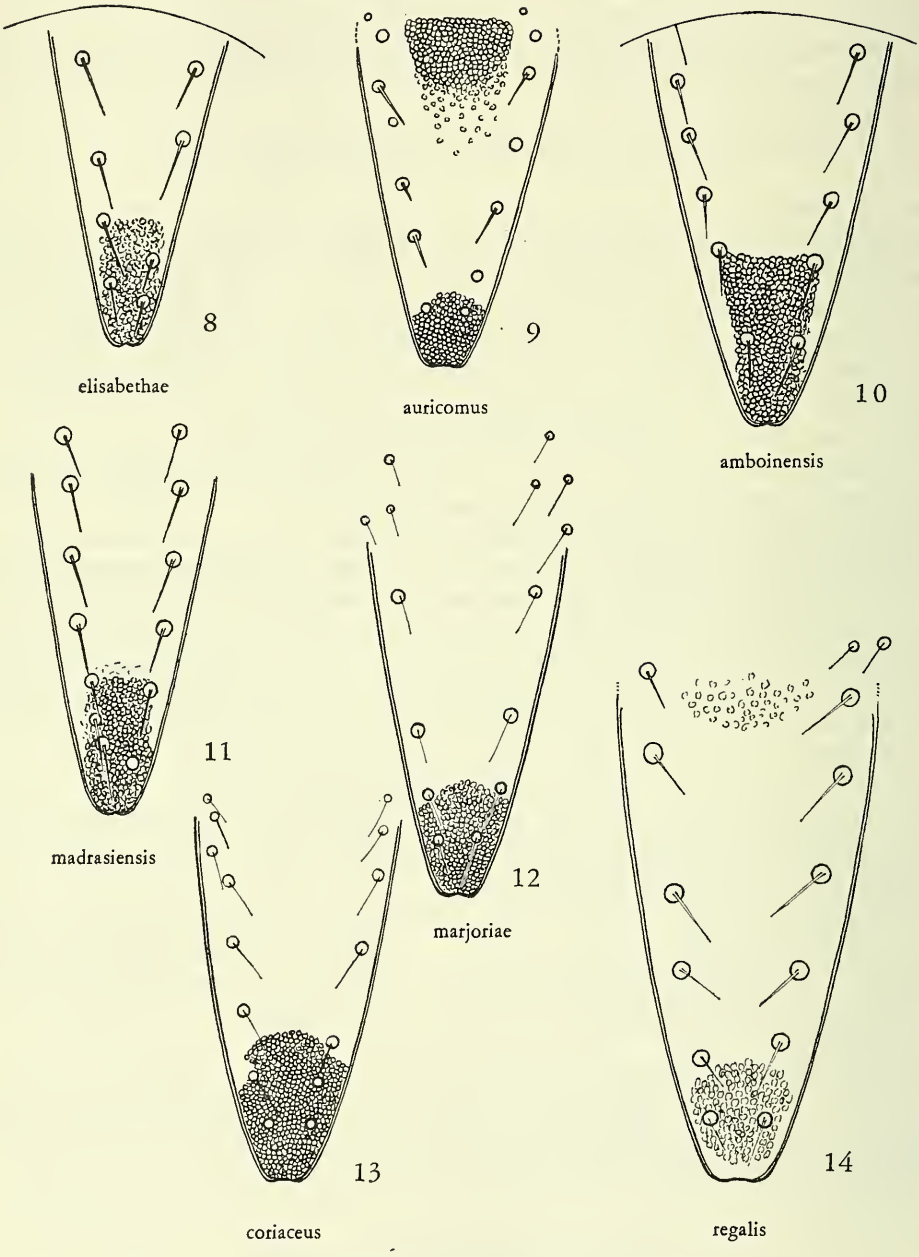


Fig. 8—14. Pygidial area of female of species of Indo-Australian and South Pacific *Psen* s.str. 8, *P. elisabethae elisabethae* Van Lith; 9, *P. elisabethae auricomus* Van Lith; 10, *P. amboinensis* Van Lith; 11, *P. elisabethae madrasiensis* subsp.n.; 12, *P. marjoriae* sp.n.; 13, *P. coriaceus* Van Lith; 14, *P. regalis* sp.n.

Psen (Psen) heinrichi spec. nov.

Male. — Black; palpi yellowish-brown, fore side of fore and mid tibiae and tarsi of all legs light brown, spurs of hind tibiae yellowish-white. Veins of wings dark brown.

Anterior margin of clypeus with slight emargination and two blunt teeth. Clypeal disk densely punctate. Interantennal carina ending between antennae in a low tooth, flattened laterally and rounded in lateral view. This tooth is connected with the underside of the antennal sclerites by a fine carina. Frons distinctly punctate, a small impunctate area against the eyes; frons much raised on both sides of the median carina, raised parts confluent with raised interocellar area. A sulcus connects depression of anterior ocellus with transverse sulcus behind posterior ocelli. Vertex with sparse but deep punctures, area behind ocelli distinctly raised. Mandibles normal. Third antennal segment three times as long as it is broad at apex, fourth segment twice as long as it is broad at apex, following segments gradually shorter, twelfth segment as long as broad, last segment about one and one-half times as long as it is broad at base, no tyloidea.

Scutum shining with deep punctures, interspaces equal to or twice as large as diameter of punctures, sometimes larger. Puncturation of scutellum sparser, metanotum with finer puncturation. Enclosed area of propodeum deep, with oblique longitudinal carinae, median two carinae diverging. Lower part of longitudinal sulcus on back of propodeum broad. Smooth area on both sides behind enclosed area not large, about twice as broad as long, towards the longitudinal sulcus distinctly raised. Back of propodeum with very strong reticulate carination, enclosing some large smooth multi-angular areas. Sides of propodeum almost smooth, separated from carination of back by a long bent carina. Mesopleura and mesosternum with fine puncturation. Acetabular carina about half as long as distance between ends of epicnemial carinae. Epicnemial carina connected with mesopleural signum. Interepicnemial area not with distinct transverse striation. Legs normal, back of hind femora smooth with longitudinal row of fine piliferous punctures, upper half bare, lower half with a few long hairs. Both recurrent veins ending in second submarginal cell.

Petiole flattened dorsally, sides depressed with short upper basal keel and distinct lower keel. Ventrally an indistinct keel posteriorly and a few punctures, each bearing a long hair. Length of petiole about 7—8 times the width in the middle. Gastral tergites with fine and wide-spread puncturation; puncturation much denser at margin of first tergite and sides of base of second tergite. Fifth tergite with smooth margin. Second gastral sternite shining with a few hair-bearing punctures.

Appressed pubescence of face silvery, also with a few long erect hairs. Rest of body with a greyish-white pubescence which is longest on back of propodeum. Apical margin of first tergite and sides of base of second tergite with dense and short whitish pubescence; following tergites with a few long hairs on disk. Apical margin of sternites with a row of long and stiff hairs, on disk some shorter pubescence. Last sternite with dense brownish pubescence, laterally margined by a row of piliferous punctures. Apical margin of third and fourth gastral sternites medially with long erect fasciculate hairs, on each sternite divided into four separate bundles.

Length about 12 mm.

Female unknown.

S.W. Celebes: 1 ♂ (holotype), Bonthain, Wawa Karaeng, 1100 m, Sept.-Oct. 1931, coll. G. Heinrich (ZMB).

The pubescence of the gastral tergites is not dense as in *P. nitidus,* but the smooth areas of the propodeum are rather short and the acetabular carina is long. Although these latter two characters would suggest the group of *P. nitidus,* I prefer to place this male provisionally into the group of *P. elisabethae.* The decision whether it is correctly placed or whether it belongs to the group of *P. nitidus,* depends upon the structure of the pygidial area of the female.

Psen (Psen) regalis spec. nov.

Female. — Head and thorax black. Antennae reddish (dorsally slightly darkened), mandibles reddish except dark tips, palpi testaceous, anterior margin of clypeus reddish-brown. Tegulae and part of pronotal tubercles reddish. Veins of wings reddish-brown. Legs including trochanters and apices of coxae red. Petiole, sides of first and second gastral tergites, ventral plate of petiole and second sternite dark reddish.

Clypeus with slight emargination, densely punctate, anterior margin with fine transverse striation. The interantennal carina ends below in a distinct tooth which is connected with the antennal sclerites by fine carinae. A small smooth area near oculi and vertex somewhat raised. Frons between ocelli and antennae with fine puncturation, frons laterally and also vertex with remote fine puncturation. Mandibles normal.

Scutum densely punctate, punctures very fine on anterior third part and at the sides, stronger on posterior part, interspaces there sometimes less than diameter, but usually larger than diameter of punctures. Scutellum with remote coarse punctures, metanotum much finer punctate. Enclosed area of propodeum normally depressed, between median two carinae some irregular rugae, behind each lateral part of enclosed area a distinct smooth area, back of propodeum with very coarse reticulate carination. Mesopleura with indistinct puncturation. Metapleura smooth. Short acetabular carina, in front of and behind this carina some fine transverse striation. Back of hind femora with longitudinal line of many fine punctures, each with a very short fine hair. Outer side of hind tibiae with a longitudinal row of short thorns. Second recurrent vein of fore wings ending in second submarginal cell near apex.

Petiole almost cylindrical, slightly flattened dorsally and anterolaterally, about 6.5—7.5 times as long as wide in the middle. Gastral tergites with fine puncturation, including hind margin, except on hind margin of first tergite where the puncturation is dense. Hind margin of fifth tergite impunctate, bordered by a few large punctures. Pygidial area elongate-triangular, shining, a few punctures along the lateral margins (fig. 14). Gastral sternites with a few strong punctures in front of the impunctate hind margin.

Pubescence of face golden, appressed and also with a few long hairs. Head and thorax with long golden-brown hairs, mesosternum with dense, short, golden pubescence. Gastral tergites with short golden-brown pubescence; a few long hairs on disk of second gastral sternite, following sternites with a few long hairs arising from large punctures along the impunctate hind margin.

Length about 12 mm.

Male unknown.

Solomon Islands: 1 ♀ (holotype), Vella Lavella, Ulo crater, 10 m, 17 Dec. 1963, 1 ♀ (paratype), Kolombangara, Gollifer's Camp, 700 m, 23 Jan. 1964, both coll. P. Shanahan, Malaise trap (BISH).

This beautiful species which certainly belongs to the group of *P. elisabethae,* is easily recognized by its golden face and the brown petiole.

Psen (Psen) coriaceus Van Lith

1959, Van Lith, Zool. Verh. Leiden 39 : 34—36.

The female which was recorded in my earlier paper (1959) as a paratype of *P. coriaceus* from Mt. S. Tomas, is now considered as a new species: *P. marjoriae.*

A more detailed figure of the pygidial area of the female of *P. coriaceus* is given here (fig. 13, holotype).

The acetabular carina is shorter than in *P. nitidus,* but relatively long in comparison with other *Psen.* In the male this carina is even longer than half the distance between the epicnemial carinae.

The scutum of the female from Negros, recorded in 1959, is much finer punctate than in the holotype; a male from the more southern Mindanao Island, on the contrary, is more coarsely punctate than the allotype from Mindoro. I am hesitating to consider these specimens as separate subspecies, as long as we have no further material available.

Psen (Psen) marjoriae spec. nov.

1959, Van Lith, Zool. Verh. Leiden 39 : 34—36 (partim).

Female. — Black; scutum, scutellum and metanotum with somewhat plumbeous shine. Fore side of fore tibiae and tarsi (except base of basitarsus) of fore and mid legs brown. Ventral side of hind basitarsus brown, following tarsal segments apically somewhat brownish. Apical spurs of mid and hind tibiae whitish. Veins of wings dark brown.

Clypeus with broad margin which is emarginate as in *P. coriaceus* and dull, impunctate; disk of clypeus densely punctate. Interantennal tooth as in *P. coriaceus.* Central part of frons irregularly raised and coarsely punctate, sometimes punctures in distinct rows; area near eyes smooth, not distinctly raised as in *coriaceus.* Vertex much finer punctate, postocellar and interocellar areas raised. Antennae gradually thickened towards apex. Scutum shining, coarsely punctate, punctures sometimes in rows. Posterior two-thirds of tegulae smooth. Scutellum more sparsely punctate; metanotum almost impunctate. Epicnemial carinae as in *coriaceus.* Acetabular carina short. Epicnemial areas smooth, less distinctly separated from inter-epicnemial area, which is finely and densely punctate. Enclosed area of propodeum somewhat depressed, shining but with traces of coriaceous sculpture; distinct longitudinal carinae. Smooth areas behind enclosed area partly with coriaceous sculpture, not as distinct as in *coriaceus.* Posterior part of propodeum irregularly, not very coarsely, carinate. Sides of propodeum shining with some fine sculpture along posterior carina. Hind tibiae dorsally with a row of fine, black spines. Second recurrent vein of fore wings ending in second submarginal cell.

Petiole about eight times as long as broad in the middle, cylindrical, dorsally slightly flattened. Hind margin of gastral tergites 2—5 smooth, impunctate, broadest medially and gradually narrowing towards the sides. A few punctures stronger than those on the disk border the impunctate margin of the fifth tergite. Rest of tergites finely, not densely punctate. Greater part of second gastral sternite smooth, almost impunctate and with broad smooth margin; following sternites finely reticulate at base. Last segment with a few large punctures laterally. Pygidial area as in *P. elisabethae elisabethae* but punctures smaller (fig. 12).

Face with silvery, appressed pubescence and also with a few long erect hairs. Rest of body with greyish-white pubescence, on scutum yellowish-grey. Punctures of pygidial area each with backwards-directed bristle. Last tergites, and all sternites, with a few long and stiff hairs separating the smooth apical margin from the disk. Base and apex of hind tibiae with dense white pubescence on inner side.

Length about 10.5 mm.

Philippine Is.: 1 ♀ (holotype), Mt. Sto. Tomas, 7200 ft., near Baguio (Luzon), 27 Dec. 1952, H.M. and D. Townes (coll. Townes).

This specimen closely resembling *P. coriaceus* was thus far mistaken for the latter as I did not earlier pay attention to the puncturation of the gastral tergites and their impunctate margins. The same broad impunctate margin of the gastral tergites was also found in a few more species of the group of *P. elisabethae* and of *P. rufiventris*. *P. marjoriae* is easily distinguished from *P. coriaceus* by the puncturation of the tergites and by the whitish tibial spurs.

According to information received from Dr. Clare R. Baltazar the temperature on Mt. Santo Tomas, which is about 7200 feet high, is sometimes as low as 36—45 degrees Fahrenheit and temperate or subtemperate trees belong to its flora, such as naturally growing pines and various species of oak.

Mt. Makiling, where *P. coriaceus* has been found, is lower, about 300 feet, the temperature near the summit is usually between 70 and 80 degrees and the flora is quite different.

A female from Baguio, 15 km away from Mt. Sto. Tomas (there is no record of the altitude at which this specimen has been taken) agrees with the description of *P. coriaceus*. The hind basitarsi are dark dorsally but all tarsi are generally paler than in *P. marjoriae*. The hind margins of the gastral tergites are richly punctured.

I regret that only one specimen of *P. marjoriae* is known thus far and I have been hesitating about its systematic status. However, especially in view of the conspicuous impunctate margins of the gastral tergites, I feel justified to describe it as a distinct species. It is to be hoped that more and ample material will become available in the near future.

I have the pleasure to dedicate this species to Dr. Marjorie Townes who, together with the other members of the Townes family, collected so many interesting Philippine Psenini.

Psen (Psen) novahibernicus Van Lith

1965, Van Lith, Zool. Verh. Leiden 73 : 33—34.

The original description was based on three males. Here follows the description of the female, which was collected together with the holotype.

Black, greater part with bluish shine. Mandibles somewhat reddish near apex, fore side of fore tibiae (also in male), ends of all tibiae and all tarsi yellowish-brown, basitarsi somewhat paler, tibial spurs straw-yellow. Veins of wings black.

Anterior margin of clypeus as in male. Interantennal carina and puncturation of frons and vertex as in male. Postocellar and interocellar area slightly raised. Structure of scutum, scutellum and propodeum as in male, back of propodeum with few carinae, so that a few large enclosed areas are formed, each with very fine sculpture on the surface. Precoxal suture connected with subpleural signum. Legs less slender. Both

recurrent veins of fore wings ending in second submarginal cell. Petiole about six times as long as it is broad in the middle, anterior half laterally somewhat flattened, also dorsally somewhat flattened, no distinct lateral carinae, underside rounded, thickened apically. Gaster very shining. First tergite very sparsely punctate on disk, apical margin very finely punctate. Tergites 2—5 sparsely punctate, apical margins impunctate, separated from the disk by a line of piliferous punctures, these punctures stronger on fourth and fifth tergites. Pygidial area narrow (fig. 15), laterally with a row of punctures, each with a bristle pointing backwards. Sternites 2—4 sparsely punctate with smooth margin which is bordered laterally by a line of punctures, each with a backwards-directed bristle. Second sternite strongly shining, fifth sternite with fine coriaceous sculpture, more densely punctate. Sixth sternite densely punctate, finely so on base, coarsely on apical part, medially with an impunctate keel.

Length about 12.5 mm.

New Ireland: 1 ♀, Schleinitz Mts., Lelet Plateau, Oct. 1959, coll. W. W. Brandt (BISH).

Psen (Psen) paulus spec. nov.

Female. — Black, palpi testaceous, legs including trochanters and petiole reddish. Underside of antennae brown. Mandibles reddish-brown. Labrum red. Tegulae and veins of wings dark brown.

Clypeus densely punctate, broad anterior margin finely transversely striate and weakly emarginate. The fine interantennal carina ends between the antennae in a distinct tooth which is connected with the antennal sclerites by fine carinae. Frons distinctly raised on either side of the median carina, remotely punctate. Vertex with fine and sparse puncturation, postocellar area slightly raised. Mandibles normal. Antennal segments 9—11 about as long as broad, last segment slightly more than one and one-half times as long as its breadth at base.

Scutum with relatively coarse punctures, often in rows with interspaces much smaller than diameter of punctures, otherwise interspaces more than diameter. Anteriorly and antero-laterally the punctures are much finer. Scutellum finer and more sparsely punctate, metanotum still finer. Enclosed area of propodeum distinct, a few oblique longitudinal carinae, median two carinae much diverging. Behind the smooth areas some coarse reticulate carination. Mesopleura with indistinct puncturation, metapleura smooth. Legs normal, hind tibiae with a row of thorns on outer side. Second recurrent vein of fore wings ending near the end of the second submarginal cell.

Petiole cylindrical, dorsally somewhat flattened, about seven times as long as broad in the middle. Gastral tergites with sparse puncturation, hind margins of segments 2—5 impunctate. Pygidial area (fig. 18, holotype and 19, Hollandia) elongate-triangular, shining, with a few punctures along the margin. Sternites with sparse puncturation. Sixth sternite with a few large punctures.

Face silvery pubescent with a few long erect hairs, vertex and scutum with greyish pubescence, propodeum with long whitish hairs, gaster with sparse fine pubescence. Gastral tergites 4 and 5 and all sternites with a few long hairs near hind margin. Sixth sternite with dense, short brownish pubescence.

Male. — Apical thorn brown. Hind tibiae without thorns. Hind margins of tergites 2 etc. with a few fine punctures. Gastral sternites 3 and 4 with long dark brown fasciculate hairs at hind margin in two bundles on each segment.

Genitalia Fig. 36—37.

New Guinea: 1 ♀ (holotype), N.E. New Guinea, Wau, Morobe District, 1050 m, 16 Oct. 1961, Malaise trap, coll. J. Sedlacek; 1 ♂ (allotype), Karimui, 1080 m, 14 July 1963, coll. M. Sedlacek (BISH); 1 ♀, Hollandia, July 1938, Neth.-Ind.—American New Guinea Exp. 1938—39, coll. L. J. Toxopeus (ML).

Papua: 1 ♀, Inonda, Horanda District, April 1943, coll. W. G. Bodenstein (USNM); 1 ♂, Mondo, 5000 ft., Febr. 1934, coll. L. E. Cheesman, BM 1934—321 (BM).

The name *paulus* is used because of the small size of both holo- and allotype, which have a length of about 6.5 mm. Afterwards I received a male from Papua of about 8 mm and two females from Papua and Hollandia of about 10.5 and 11 mm. This great difference in size is rather unusual.

The male from Papua differs in a few minor details from the allotype: the fine puncturation of the scutum antero-laterally is denser and the pubescence of the scutum is somewhat brownish.

P. paulus s.str. is easily recognized by the red legs and petiole and the coarse puncturation of the scutum. The subspecies from Japen Island has a brassy face and finer punctures and the subspecies from the Solomon Islands has a much finer puncturation of the scutum (pubescence of face silvery).

Psen (Psen) paulus baduriensis subspec. nov.

Two females from Japen Island differ distinctly from the females of the nominate form from New Guinea and Papua.

They are larger (length about 10 and 12 mm), the antennal segments are slightly longer (segments 9—11 about one quarter longer than they are broad at base; last segment about three quarters longer than broad at base); the puncturation of the scutum is somewhat finer than in the nominate subspecies and the appressed pubescence of the face is more brassy than silvery.

Petiole about seven times as long as wide in the middle.

Pygidial area Fig. 20, holotype.

New Guinea: 2 ♀ (holotype and paratype), Japen Island, Mt. Baduri, 1000 ft., August 1938, coll. L. E. Cheesman, BM 1938—593 (BM).

Psen (Psen) paulus subtilis subspec. nov.

Male. — Differs from the nominate subspecies in the reddish colour of the scape of the antennae, the finer puncturation and the leaden shine of the scutum, and the brownish hairs of head and thorax, the long hairs of the propodeum being very conspicuous.

Genitalia Fig. 40—41.

Length about 9.5 mm.

Female unknown.

Solomon Islands: 1 ♂ (holotype), Kolombangara, Collifer's Camp, 700 m, 23 Jan. 1964, Malaise trap, coll. P. Shanahan (BISH).

Psen (Psen) vadosus spec. nov.

Female. — Black with a slight metallic-blue shine; fore side of fore tibiae and extreme apices of all tibiae brown, tarsi yellowish-brown. Middle part of mandibles dark reddish-brown. Palpi testaceous.

Clypeus convex, with dense superficial puncturation and broad, almost smooth, impunctate margin which is slightly emarginate. The interantennal carina ends between antennae in a low tubercle connected with underside of antennal sclerites by a fine carina. Frons with some puncturation on both sides of median carina, against the eyes a slightly raised smooth area, on either side of frontal carina frons somewhat protruding. Vertex with fine and remote punctures, postocellar area raised. Mandibles normal. Antennae gradually thickened towards apex, segments 9—11 about as long as broad. Last segment about one and one-half times as long as broad at base.

Scutum with distinct punctures, irregularly placed, sometimes in short rows but interspaces usually two or three times diameter of punctures, central part of scutum largely impunctate, scutellum and metanotum with a few fine punctures. Enclosed area of propodeum with less longitudinal carinae than usual (six long carinae and also a few incomplete carinae), median two carinae much diverging. Enclosed area not much depressed, posteriorly not distinctly bordered and gradually passing into the smooth areas behind the enclosed area. Back of propodeum with mostly fine, irregularly reticulate carination. Mesopleura with very fine remote punctures. Acetabular carina reaching about halfway the distance between the median line and the end of the epicnemial carina. Legs normal, back of hind femora smooth with median longitudinal line of very fine piliferous punctures. Second recurrent vein of fore wings interstitial. Petiole about seven times as long as broad in the middle, almost cylindrical, with upper lateral edge; sides anteriorly somewhat depressed. Gastral tergites with sparse and fine puncturation, margin of tergites 2—5 impunctate, sixth tergite with elongate triangular pygidial area (Fig. 16, holotype), which is very shining and has a few punctures along the margin. Gastral sternites with a few fine punctures, second sternite almost smooth.

Appressed pubescence of face silvery, temples and mesosternum also with silvery pubescence. Rest of body with greyish pubescence, a few long stiff hairs along margin of tergites and sternites, sternite 6 with dense yellowish-grey pubescence, partly with long, backwards directed hairs.

Length about 8.5 mm.

Male. — Legs paler: femora more or less brownish, mid and hind tibiae much paler brown. Sides of petiole somewhat more depressed so that almost two carinae are formed. Antennal segments 9—12 slightly longer than broad, last segment about one and one-half times as long as its width at base.

Second gastral sternite with smooth posterior margin, bordered by a few long stiff hairs. Margins of following sternites finely pubescent and with a few long stiff hairs, margins of third and fourth sternites each with two bundles of fasciculate hairs. Sixth sternite with a patch of dense short brownish pubescence and a great number of long, backwards directed stiff hairs.

Genitalia Fig. 42.

Length about 8.5 mm.

Solomon Is.: 2 ♀ (holotype and paratype), Santa Ysabel, Tamatahi, 450 m, 2 July 1960, coll. C. W. O'Brien; 1 ♂ (allotype), Bougainville S., Buin, 2 June 1956, coll. J. L. Gressitt; 1 ♂ (paratype), Bougainville, Mumurai, 400 m, 7 June 1956, coll. J. L. Gressitt (all BISH).

The sexes come from different islands; this may explain the difference in the colour of the legs.

P. vadosus differs from its relatives in the enclosed area of the propodeum not being

distinctly separated from the smooth areas on the propodeum and in the long acetabular carina.

Psen (Psen) bryani Perkins & Cheesman

1928, Perkins and Cheesman, Insects of Samoa 5 (1): 28—29 (*Psen bryani*).

I have studied the allotype (♂) in the collection of the British Museum (Natural History), but not the female. In the material received from the Bernice P. Bishop Museum I found three males which undoubtedly also belong to this species. Their tarsi are dark. Hind margins of gastral tergites 2—5 impunctate. Genital apparatus resembling that of *P. elisabethae* but of extraordinary large size (Fig. 38 and 39).

The only characteristics I could find to distinguish this species from *P. cheesmanae* from the New Hebrides are the darker tarsi of the male and probably also its darker fasciculate hairs of the gastral sternites.

New records: Samoa: 1 ♂, Tutuila, Afono trail, March 1930, coll. O. T. Fullaway; 2 ♂, Tutuila, Mt. Alava, 500 m, 20—24 Febr. 1965, Malaise trap, coll. G. A. Samuelson (BISH).

Psen (Psen) cheesmanae Krombein

1949, Krombein, Proc. Hawaiian Ent. Soc. 13 (3): 364—365 (♂).

Krombein based his description on two males, collected by Miss L. E. Cheesman. In the collection of the British Museum (Natural History) I found three females, also collected by Miss Cheesman, same locality and same period, which are probably the opposite sex of this species.

The hind margins of the gastral tergites 2—5 are impunctate, as in the male holotype. The puncturation of the scutum of these females and of the holotype resembles to a great extent that of the male of *P. bryani* Perkins & Cheesman. Pygidial area Fig. 17.

New Hebrides: 3 ♀, Santo, Aug.—Sept. 1929, coll. L. E. Cheesman, BM 1929—537 (BM).

Psen (Psen) bishopi spec. nov.

Female. — Head and thorax black; middle part of mandibles reddish, palpi testaceous, underside of scape reddish-brown, apex of antennae below somewhat brownish, tegulae reddish-brown. All legs including trochanters reddish. Petiole, first and second gastral tergites except darkened apical margin, second sternite and apical margin of following sternites reddish. Rest of gaster black. Veins of wings dark brown.

Clypeus raised below, densely punctate, anterior margin with light emargination, surface of this margin shining with very fine transverse striation (just visible under 30 x magnification). Interantennal carina ending in a low triangular tooth which is connected with the underside of the antennal sclerites by a fine carina. Only central part of frons with dense superficial puncturation, rest of frons and vertex shining, with few punctures. Postocellar area slightly raised. Mandibles and antennae normal.

Scutum with fine puncturation on fore part, punctures stronger on posterior half, interspaces often a few times larger than diameter of punctures, on posterior half punctures partly in rows. Scutellum and metanotum smooth, with a few punctures. Enclosed area of propodeum but slightly concave, latero-posteriorly not distinctly separated from the smooth surface behind the enclosed area and with long oblique longitudinal carinae,

median two carinae strongly diverging. Behind enclosed area on each side of median sulcus a large smooth area, partly on horizontal part of propodeum. Back of propodeum with irregular, not very strong reticulate carination. Mesopleura almost smooth, metapleura smooth and shining. No distinct acetabular carina.

Both recurrent veins end in the second submarginal cell. Legs normal, back of hind femora smooth with a longitudinal line of minute piliferous punctures. Petiole cylindrical, dorsally somewhat flattened, about 7 times as long as wide in the middle. Gastral tergites and sternites with very few fine punctures, broad hind margin of tergites 2—5 impunctate. Pygidial area elongate-triangular, smooth with a few punctures along the margin (fig. 21).

Face with silvery appressed pubescence and a few long erect hairs, dorsum and back of thorax with golden-brown long pubescence, pubescence of mesosternum paler. Gaster almost bare, a few long stiff hairs near margin of sternites.

Length about 10 mm.

Male unknown.

Solomon Islands: 1 ♀ (holotype), Kolombangara, Collifer's Camp, 700 m, 24 Jan. 1964, coll. P. Shanahan (BISH).

Easily distinguished from other species of the group by the red petiole and first gastral tergites and by the almost impunctate gaster.

Group of *Psen orientalis*

This group is even larger than that of *P. elisabethae,* including the three species just described by Tsuneki from Formosa now counting 20 forms. All have the characteristic shape of the propodeum. The females of most of the species belonging here have a broad and opaque pygidial area, but in *P. hakusanus* and a few allied species the pygidial area is narrower and more or less shining.

The number of tyloidea on the antennae of the males varies, sometimes they are even absent.

Psen (Psen) terrigenus Van Lith

1959, Van Lith, Zool. Verh. Leiden 39 : 30—34 (♀).
1965, Van Lith, Zool. Verh. Leiden 73 : 39.

This species was described from three females from West Java, no male being known at that time. A male, collected in East Java was discovered recently in the collections of the British Museum (Natural History), London. The puncturation of this specimen is strong, as in the females. The genitalia resemble those of *P. orientalis;* this confirms my earlier supposition (1965) that *P. terrigenus* belongs to the group of that species.

Fore and mid tarsi dark brown, hind tarsi paler (in the female tarsi reddish brown).

Clypeus convex, median part of anterior margin with shallow triangular emargination, not distinctly separated from lateral parts. Frons with dense puncturation, punctures distinct and mostly in rows. Frontal line fine but distinct. Antennal segments 4—13 with broad oblong, longitudinal, shining tyloidea; tyloidea of segments 4—11 about as long as segment, broadest on first segments, on the 12th segment ending before apex, on the 13th segment very small.

Propodeum generally similar to that of female but carination on back coarser and

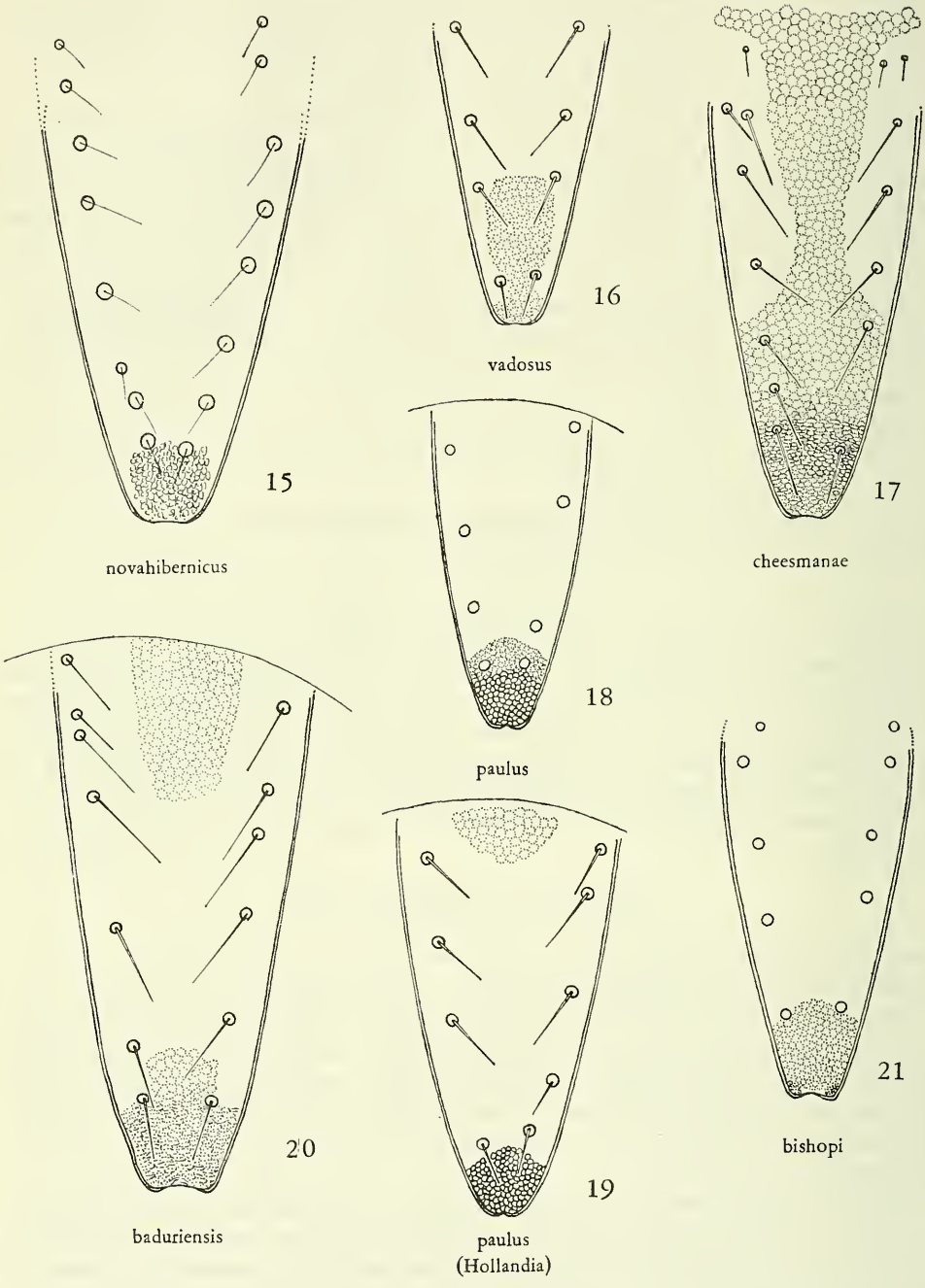


Fig. 15—21. Pygidial area of female of species of Indo-Australian and South Pacific *Psen* s.str. 15, *P. novahibernicus* Van Lith; 16, *P. vadosus* sp.n.; 17, *P. cheesmanae* Krombein; 18, *P. paulus* sp.n. (N.E. New Guinea); 19, *P. paulus* sp.n. (Hollandia); 20, *P. paulus baduriensis* subsp.n.; 21, *P. bishopi* sp.n.

extending higher, leaving a narrow, almost smooth area laterally behind the enclosed area. Acetabular carina (with a few parallel carinae) not yet reaching halfway the epicnemial carinae.

Face with silvery pubescence. Hind margin of third and fourth gastral sternites with fringe of fasciculate yellowish-golden hairs.

Length about 8.5 mm.

East Java: 1 ♂, May 1938. Tengger Highlands, Nongkodjadjar, 1100 m, coll. Mrs. M. E. Walsh (BM).

Psen (Psen) hakusanus seminitidus Van Lith

1934, Gussakovskij, Ark. Zool. 27A (21): 7 (*Mimesa kohli*).
1965, Van Lith, Zool. Verh. Leiden 73 : 40—41 (*Psen (Psen) seminitidus*).
1966, Tsuneki, Etizenia Fukui Univ. 14 : 9—10 (*Psen (Psen) hakusanus seminitidus*) ♂.
1967, Tsuneki, Etizenia Fukui Univ. 24 : 2, ♀.

In 1966 Tsuneki studied a male from Formosa which he provisionally identified as *P. hakusanus seminitidus*. He noticed some differences from the females reported from China in 1965 (Van Lith). According to Tsuneki the puncturation is as close as in *P. hakusanus* s.str. and the petiole has no ventral median carina. Tsuneki therefore suggested that it is a different geographical race.

In his recent paper Tsuneki (November 1967) also recorded a female from Formosa and Sauter collected there two females which are very similar to *P. hakusanus seminitidus*. They differ, however, in the slightly narrower pygidial area as compared with the figure in my paper of 1965. The puncturation is less dense than in *P. hakusanus* s.str. The ventral median keel of the petiole is distinct, as in the specimens from the continent.

Length about 9 mm.

A further study based on more extensive material would be very welcome.

New records from Formosa: 2 ♀, Hoozan, Nov. 1910, coll. H. Sauter (ZMB).

Psen (Psen) kulingensis Van Lith

1965, Van Lith, Zool. Verh. Leiden 73 : 41—42 (S. China).

Two females from Japan are very probably conspecific with *P. kulingensis* described from S. China. The petiole is slightly longer, the legs and wing veins are somewhat paler than in the paratype available for comparison. The pygidial area is less broad. Perhaps these specimens form a new subspecies. They differ from *P. affinis* Gussakovskij, from Japan, in the absence of a ventral keel of the petiole and in the somewhat coarser puncturation of the scutum.

Japan: 2 ♀, Chuzenji, July—Aug. 1913, 4000—5000 ft., coll. F. Muir (BISH).

Psen (Psen) simlensis spec. nov.

Female. — Black; median part of mandibles reddish-brown, antennae somewhat brownish. Palpi and tarsi reddish-brown. Spurs of tibiae yellowish-brown. Ventral side of gaster partly dark reddish-brown. Veins of wings dark brown.

Clypeus convex, shining, with fine punctures, median part of anterior margin protruding and somewhat raised, margin smooth, slightly emarginate (Fig. 23, holotype). Frontal carina fine, ending between antennae in a distinct tooth, which is connected

with antennal sclerites by very fine, bent carinae. Frons above antennae with fine punctures, upper part of frons and vertex shining, with sparse and minute punctures. Frons distinctly raised in front of each of the posterior ocelli, also postocellar area somewhat raised. Antennae normal, segments 9—11 about as long as they are broad, twelfth segment slightly more than one and one-half times as long as its width at base.

Scutum shining with fine punctures, interspaces mostly a few times as large as diameter of punctures, sometimes only just as large. Scutellum and metanotum shining, with scarce puncturation. Enclosed area of propodeum with oblique carinae, median two carinae almost parallel, surface between latter two carinae somewhat irregular. A smooth area, broadest on the sides, behind the enclosed area, on dorsal side of propodeum, narrowing towards the median sulcus. Back of propodeum with irregular reticulate carination. Median sulcus with a few transverse carinae. Mesopleura and mesosternum smooth and shining, with minute punctures. No acetabular carina. Mid tibiae with a short longitudinal row of three or four long thorns at apex, hind tibiae dorsally with a longitudinal row of short, slightly bent, pale thorns. Second recurrent vein of fore wings interstitial. Petiole almost cylindrical, dorsally somewhat flattened. Tergites and sternites, except narrow hind margins, with sparse and fine punctures. Hind margin of fifth gastral sternite emarginate, sixth sternite densely punctate, with a narrow, smooth and shining median keel. Pygidial area elongate-triangular (Fig. 22), surface with very fine coriaceous sculpture, a few fine punctures along the lateral carinae.

Pubescence of face silvery, appressed, with a few long erect hairs. Pubescence of rest of body greyish, long on propodeum, sparse on gaster. Sternites 2—5 with a few long and stiff hairs before hind margin. Sixth sternite with dense and short pubescence.

Length about 8.5 mm.

Male unknown.

North India: 1 ♀ (holotype), Simla (Himachal Pradesh or Simla, Calcutta), 12 Aug. 1918, Bruneti coll. 1927—184 (BM); 1 ♀ (paratype), Mussoorie, 7500 ft., 24 June 1962, No. 22, coll. V. Gupta (UDE).

There is no doubt that Simla in the state of Himachal Pradesh is concerned.

P. simlensis resembles the species of the subgroup of *P. hakusanus*, which have also a narrow and more or less shining pygidial area, but it is easily distinguished by the almost cylindrical petiole.

Psen (Psen) orientalis Cameron

1890, Cameron, Mem. Proc. Manch. Lit. Phil. Soc. (4) 3 : 269, ♀ (*Psen orientalis*; Madras, India).
1902, Cameron, Jl. Bombay Nat. Hist. Soc. 14 : 289, ♀ and ♂ (*Psen reticulatus*; Deesa (!), India).
1965, Van Lith, Zool. Verh. Leiden 73 : 42—44.

After the study of a fine series of fresh specimens, all females, from Simla (type-locality of *P. reticulatus* Cameron), a supplementary description can now be given.

Female. — Black, also legs and veins of wings. Only the tips of the mandibles, the tibial spurs and the claws of the tarsi are dark reddish. Palpi dark brown. Hind tibiae dorsally with short reddish spines. Mid tibiae and basitarsi, also apex of hind tibiae and hind basitarsi with longer, pale spines. Apex of pygidial area not always with reddish spot.

Clypeus slightly raised before the impunctate anterior margin. Frontal carina ending in a small tooth and an angular carina, which is not connected on either side with the antennal sclerites. Postocellar area slightly raised. Third antennal segment almost twice

as long as fourth segment. Dorsal part of propodeum bordered by a fine high carina. Below this carina a narrow area without carinae but with piliferous punctures.

Petiole laterally with distinct upper and lower edges and on posterior half of ventral side with unsharp carina which is more distinct on ventral plate of petiole.

Scutum with very fine and short brownish pubescence and long whitish hairs. Mesosternum with short white pubescene and long white hairs.

New records: N. India, Simla Hills: Narkanda, 9000 ft., 6 ♀, 3 Oct. 1962, coll. Gupta, No. 27; 3 ♀, 5 Oct. 1962, coll. Gupta, No. 30 and 31; Chini bungalow, 8600 ft, 2 ♀, 11 and 13 Oct. 1962, coll. Gupta, No. 40 (UDE).

As I explained in 1965 in my opinion *P. orientalis* and *reticulatus* are conspecific but a series of fresh material, males as well as females, from South India would be welcome to confirm this.

Group of *Psen refractus*

Psen (Psen) refractus Nurse

1903, Nurse, Jl. Bombay Nat. Hist. Soc. 15 : 11—12, ♀ (Mt. Abu, N. India).
1965, Van Lith, Zool. Verh. Leiden 73 : 50—51.

Four females from Nilgiri Hills (S. India) are slightly darker than the type from N. India. The first and second gastral tergites are red, but the posterior margin of the second tergite is darkened medially. Base of third tergite red laterally. Apex of petiole below and whole ventral plate of petiole red, also second sternite. Clypeus completely black. Femora and greater part of tibiae black.

A male from the same locality is a little more red than the females: second tergite completely red, also basal half of third sternite. Last antennal segment brown below. Structure of antennae as in *P. refractus meridianus* (Van Lith, 1965).

As the differences between the females from Mt. Abu and from Nilgiri Hills are so unimportant, I do not think that the specimens from Nilgiri Hills belong to a different subspecies. *P. refractus meridianus* from Kodaikanal, Palni Hills (two females and four males, Van Lith, 1965) is much darker and this may indeed be a distinct subspecies. The Palni Hills are not so far distant from the Nilgiri Hills, but the wasps were collected there at the altitude of 6500 feet whereas those from the Nilgiri Hills were found at 3200—3400 feet. Moreover these mountainous regions seem to be well separated geographically by plains.

New records: Nilgiri Hills, South India, 1 ♀, Singara, 3400 ft., May 1954, coll. P. S. Nathan (coll. Ferguson), 3 ♀ and 1 ♂, Devala, 3200 ft., Oct. 1960, coll. P. S. Nathan (ML).

Psen (Psen) krombeini Van Lith

1965, Van Lith, Zool. Verh. Leiden 73 : 52—55.

New records: 11 ♀, S. India, Madras State, Anamalai Hills, Kadamparai, 3500 ft., May 1963, coll. P. S. Nathan (ML).

Group of *Psen aureohirtus*

Psen (Psen) aureohirtus aureohirtus Rohwer

1921, Rohwer, Phil. Jl. Sc. 18 : 322—323 (*Psen (Mimesa) aureohirta*).
1959, Van Lith, Zool. Verh. Leiden 39 : 49—50 (*Psen (Psen) aureohirtus*).
1965, Van Lith, Zool. Verh. Leiden 73: 56.

New record: Philippine Is., 1 ♂, Baguio (Luzon), April 1917, coll. F. X. Williams (BISH).

Psen (Psen) toxopeusi Van Lith

1959, Van Lith, Zool. Verh. Leiden 39 : 47—49 (♀).

The original description was based on three females collected in 1936. In the material from the Berlin Museum I found two females, also collected in S. W. Celebes, by G. Heinrich, in 1931. In these specimens the acetabular carina is not distinctly present. The third gastral sternite is partly darkened.

A male, taken at the same locality, is very similar. Antennae long, sixth segment with narrow longitudinal carina, seventh segment with broader tyloidea, segments 8—12 with almost circular depression, last segment with small round tubercle.

Hind margin of third and fourth gastral sternites with long, brown and fasciculate hairs. Clypeus with appressed silvery pubescence, supra-clypeal area with appressed, pale golden pubescence, frons with erect golden pubescence.

Genitalia resembling those of *P. melanosoma* (Fig. 44).

Length about 11 mm.

New records from S. W. Celebes: 2 ♀ and 1 ♂, Bonthain, Wawa Karaeng, 1100 m, Sept.-Oct. 1931, coll. G. Heinrich (ZMB).

Group of *Psen ruficrus*

Psen (Psen) ruficrus Van Lith

1965, Van Lith, Zool. Verh. Leiden 73 : 62—63 (♂).

A female collected in the close neighbourhood of the locality where two males were found six years earlier, is undoubtedly conspecific.

It has no distinct bluish shine on head and thorax and the orange-red colour is slightly more extended: legs including a great part of coxae, petiole with ventral plate, lower margin of first tergite. Mandibles except dark tips and labrum orange-red. Upper side of scape of antennae red, most of the following segments with dark red spot on ventral side. Veins of wings dark brown.

Lower part of clypeus protruding and with sharp lateral carinae (resembling the clypeus of the females of the group of *P. refractus*), anterior margin with triangular emargination (Fig. 7), surface of disk densely punctate. The fine interantennal carina ends in a low smooth triangle which is connected with the antennal sclerites by fine carinae. Frons distinctly punctate between antennae and ocelli, smooth laterally. Vertex with a few fine punctures, interocellar area stronger punctate and somewhat raised. Antennae slightly thickened towards apex. Mandibles normal.

Scutum, scutellum and metanotum with fine remote punctures. Propodeal enclosure with distinct longitudinal carinae, median two carinae strongly diverging. Upper part of back of propodeum rounded laterally, vertical part flat, completely and coarsely carinate; sulcus narrow. Hind tibiae dorsally with longitudinal row of reddish thorns, at base with a short second row, apex with four longer thorns. Second recurrent vein of fore wings interstitial (in right wing ending just in second submarginal cell, owing to deformation). Petiole cylindrical except short anterolateral carinae. Gaster almost completely smooth with very few minute punctures, margins completely smooth. Pygidial area large, broadly triangular, base convex, surface coriaceous with 7—8 irregular rows of large punctures, narrow margin impunctate (Fig. 5).

Face with golden pubescence, cheeks more silvery pubescent, rest of body with long

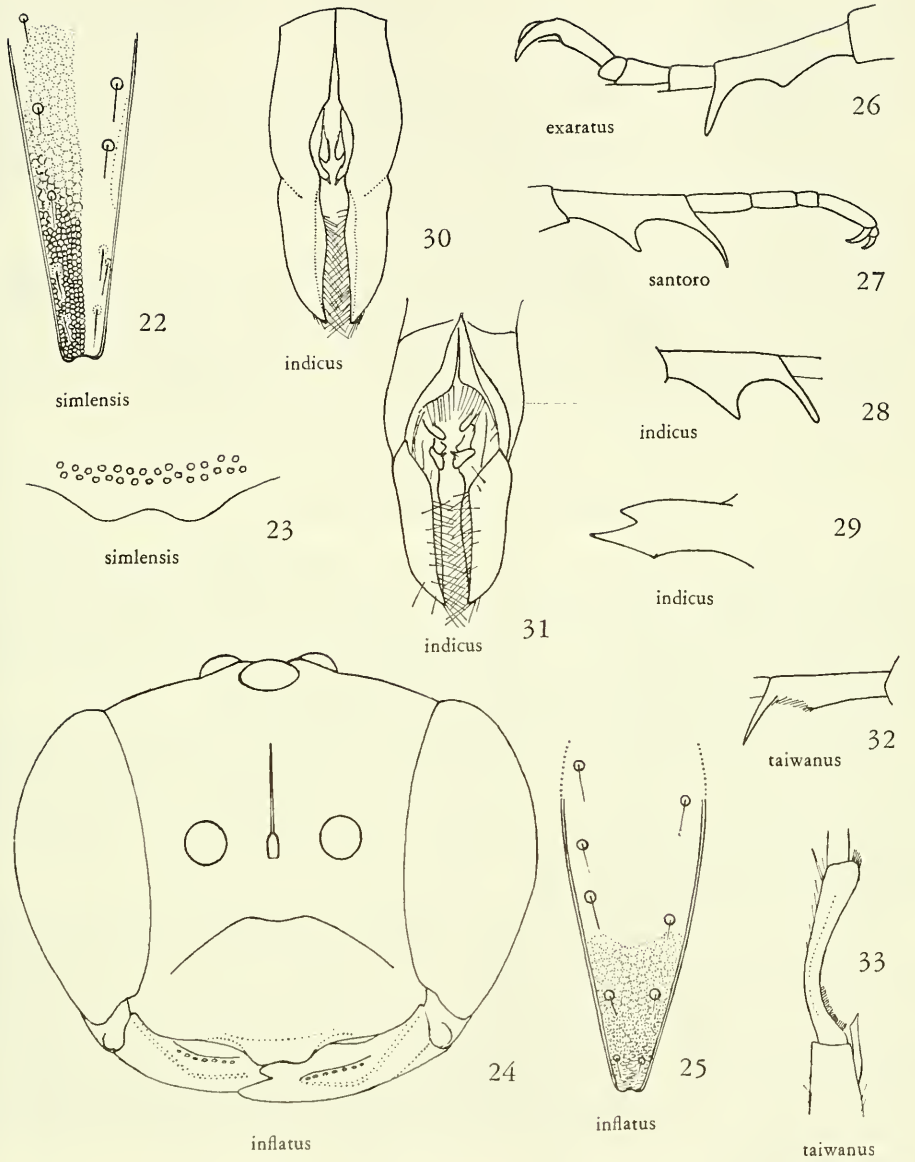


Fig. 22—23. Pygidial area and anterior margin of clypeus of *Psen* (*Psen*) *simlensis* sp.n. (♀) Fig. 24—25, face and pygidial area of *Psen* (*Mimesa?*) *inflatus* sp.n. (♀). Fig. 26—33, subspecies of *Psen (Punctipsen) exaratus* (Eversmann), all males. 26, mid tarsus of *P. exaratus* s.str.; 27, mid tarsus of *P. exaratus santoro* Yasumatsu; 28—29, mid basitarsus and mandible of *P. exaratus indicus* subsp.n.; 30—31, dorsal and ventral view of genitalia of *P. exaratus indicus* subsp.n.; 32—33, mid basitarsus and fore basitarsus of *P. exaratus taiwanus* Tsuneki.

brownish hairs, scutum darker. Gaster very sparsely haired. Pygidial area with backwards directed hairs.

Length about 11 mm.

New Guinea: 1 ♀, N.E. New Guinea, Daulo Pass, 2400 m, 15 May 1963, coll. J. Sedlacek (BISH).

I am more convinced now that *P. ruficrus* is closely related to *P. melanosoma* of the group of *P. aureohirtus*. The pygidial area of the female, the golden clypeal pubescence and the extent of red colour also point to a relationship with *P. toxopeusi,* of the same group, although the vertex is much less raised.

Contrary to *P. toxopeusi* the median part of the clypeus is raised in the female of *P. ruficrus* and carinate laterally. Therefore I hesitate to place it definitely in the group of *P. aureohirtus* and prefer to consider it provisionally as an intermediate form.

The species also occurs in Papua, where Miss L. E. Cheesman collected a fine series of males: 9 ♂, Mondo, 5000 ft., Febr.-March 1934, BM 1934-321 (BM).

Group of *Psen bakeri*

Psen (Psen) sedlaceki spec. nov.

Male. — Head and thorax black; reddish are: mandibles except dark red tips, legs including trochanters and hind coxae. Claws of legs, margins of pronotal tubercles, tegulae and veins of wings brown. Scape of antennae brown, palpi testaceous. Petiole, first gastral tergite, second gastral tergite except brown margin, sides of third tergite and entire second gastral sternite pale reddish. Rest of gaster black.

Clypeus dull, densely and finely punctate, anterior margin with transverse striation and triangular emargination. The interantennal carina ends in a small flat tubercle. Frons and interocellar area with fine but distinct puncturation, vertex smooth and shining, postocellar area not raised. Antennae rather long, segments 7—12 with large broad-oval tyloidea, segments 6 and 13 with a small shining tubercle. Last segment about twice as long as broad at base.

Greater part of scutum with very coarse punctures, on posterior half partly in striae. On the sides of the scutum the punctures are much finer. Scutellum with a few distinct punctures, metanotum much finer and more densely punctate. Enclosed area of propodeum with strong posterior carina, two median of the longitudinal carinae strongly diverging. Back of propodeum with coarse reticulate carination: sides with a few oblique carinae. Mesopleura and hypo-epimeral area with fine punctures. A short but distinct acetabular carina. Interepicnemial area with fine transverse striation. Legs normal. Second recurrent vein of fore wings interstitial. Petiole long, cylindrical. Gaster with minute punctures.

Pubescence of face silvery, appressed and with a few long erect hairs. Head and thorax greyish pubescent. Mesosternum with dense silvery pubescence. Gaster with very fine, short and sparse pubescence, a few long hairs near the hind margin of the last tergites and sternites. Hind margin of third and fourth sternites each with two bundles of golden-brown long fasciculate hairs. Sixth sternite with dense, short brownish pubescence.

Genitalia Fig. 43.

Length about 10.5 mm.

Female unknown.

N. E. New Guinea: 1 ♂ (holotype), Karimui, 1080 m, 14 July 1963, coll. M. Sedlacek (BISH).

This species seems to be closely related to the Philippine *P. bakeri* Rohwer, which has an entirely black gaster and petiole. They share the following characters: coarse puncturation and striation of scutum, reduced interantennal tooth and triangular emargination of clypeus. The female of *P. bakeri* has a golden pubescent face.

Punctipsen subgen. nov.

De Beaumont (1937) placed *P. exaratus* (Eversmann) in the subgenus *Psen* but he admitted that its systematical position was somewhat doubtful. Indeed the lack of fasciculate hairs on the margins of the third and fourth gastral sternites of the male distinguish *P. exaratus* from any other species belonging to the subgenus *Psen*. In both sexes the longitudinal groove and the strong punctures, which are sometimes fused into short grooves, of the petiole are properties lacking in *Psen* s.str. Only in oriental representatives of the subgenus *Mimumesa* Malloch the posterior end of the petiole has a few large punctures. Moreover, the genital apparatus of the male differs considerably from the genitalia studied thus far in the subgenus *Psen* s.str. Therefore I place *P. exaratus* in the present new subgenus.

The nominate subspecies occurs or has occurred probably in the whole palaearctic area. Four subspecies have been found in the Indo-Australian region; one of these is described here as new from South India which is the first record of *P. exaratus* from South Asia. As the oriental representatives seem to be allopatric and the differences are not important, I prefer to maintain their subspecific status as proposed by Tsuneki (1966). The differences between *taiwanus* Tsuneki and the four other subspecies are greater, however, than the differences between the latter subspecies (mid basitarsus of male, pubescence of gaster).

Punctipsen is very closely related to *Psen* s.str., the epicnemial carinae being continuous with the anterior precoxal suture (carina). The hypo-epimeral area is distinct, the upper longitudinal half of the back of the hind femora is smooth and separated from the lower half by a broad line of minute piliferous punctures. The frontal carina is complete.

The basitarsi of fore and mid legs of the male and mostly also its mandibles have special structures but these characters are not of subgeneric value.

The stipites of the genitalia are not nearly flat as in the subgenus *Psen* but swollen, also their tips, and there are no membranous lobes.

Type species of *Punctipsen*: *Mimesa exarata* Eversmann.

Key to the subspecies of *Psen* (*Punctipsen*) *exaratus*

(The females of a few subspecies being unknown, this key is only reliable for the identification of the males)

IAD = interantennal distance; AOD = antenno-ocular distance.

1. Mandibles of male ventrally with a long tooth. Basitarsus of mid legs of male with short median tooth, apical tooth long. In both sexes ratio eye-temple 1.0—1.2; ratio IAD-AOD 1.8—2. Punctures on gastral tergites 1 and 2 sparse and weak. In female apical segments of antennae ferruginous beneath. (W. Europe, Caucasus, Siberia, Korea, Japan) ..... *exaratus exaratus*

— Mandibles of male ventrally without tooth or with vestigial tooth. Ratios different 2

2. Mandibles of male without ventral tooth. Median tooth of mid basitarsus of male about half as long as apical tooth. In both sexes ratio eye-temple about 1.6; ratio (IAD-AOD about 3.2—4. In female antennae completely black. (Amami-Oshima Is.) ..... *exaratus santoro*

— Mandibles of male with vestigial tooth 3

3. Median and apical teeth of mid basitarsus about equally long. Ratio eye-temple about 1.25; ratio IAD-AOD about 2.15. First gastral tergite with very fine punctures. Underside of antennae yellowish-brown. Pubescence of gaster greyish-white, not long and erect on segments 3—5. Female unknown. (S. India). ..... *exaratus indicus* subsp. n.

— Median tooth of mid basitarsus of male at most half as long as apical tooth. Ratio eye-temple about 1.3; IAD-AOD 2.3—3 4

4. Median tooth of mid basitarsus about half as long as apical tooth, situated about halfway basitarsus. Underside of antennae dark ferruginous. Pubescence of gaster not very dense or erect. Female unknown. (Okinawa) *exaratus intermedius*

— Median tooth of mid basitarsus of male inconspicuous, situated about two-thirds of length of basitarsus from base. Punctures on gastral tergites 1 and 2 more abundant and more distinct. In female underside of antennae partly ferruginous, in one of the males light brown. Pubescence yellowish-grey, dense, long and erect, especially on gastral tergites 3—5. (Formosa) ..... *exaratus taiwanus*

Psen (Punctipsen) exaratus taiwanus Tsuneki

1966, Tsuneki, Etizenia Fukui Univ. 14 : 6 (♀).
1967, Tsuneki, Etizenia Fukui Univ. 24 : 2 (♀).

As Tsuneki was able to study only a single female from Formosa, he doubted the validity of the new form. Through the kindness of Dr. Königsmann, Humboldt-University in Berlin, I received several females and males collected by H. Sauter in Formosa more than half a century ago. Now I am completely satisfied that this form from Formosa is indeed a distinct subspecies. The male has a very short (vestigial) tooth on the ventral side of the mandibles but it is easily distinguished from the male of *P. exaratus intermedius* Tsuneki from the Okinawa Islands by the very indistinct tooth of the mid basitarsus and the smaller distance between this tooth and the apex.

Male. — Fore and mid legs almost completely brown (in female more darkened); underside of basal part of antennae more yellowish (in female brown below).

Anterior margin of clypeus with a simple triangular emargination. Mandibles ventrally with a very small tooth (cf. Fig. 29). Scape of antennae thick; antennal segments 6—13 with distinct flat tyloidea, most distinct on segments 8—11. Frons and vertex slightly raised, with distinct punctures. Scutum with strong punctures, interspaces often smaller than diameter of punctures. Rugae on upper part of back of propodeum coarse, more or less parallel. Both recurrent veins of fore wings ending in second submarginal cell. Basitarsus of mid legs with long tooth at apex; an indistinct tooth at about two-thirds of length of basitarsus from base (Fig. 32). Basitarsus of fore legs Fig. 33. Petiole dorsally with deep punctures in coarse rugae, sides and underside each with two

distinct longitudinal carinae. Apex of petiole latero-ventrally also with a number of short, irregular carinae.

Dense, yellowish-grey pubescence; apical margin of gastral tergites 2—5 with a fringe of long pale hairs with bent tips.

Length about 9—10 mm.

The female was amply described by Tsuneki. I should like to add that the second gastral sternite has a slight but broad median longitudinal depression. Base and hind margin of tergites 3—5 are densely punctate. The petiole has indeed only two lateral carinae; the ventral side is rounded (it has two carinae in the male) with coarse punctures and small rugae on apical half.

New records from Formosa: 3 ♀, Taihorin, May and Oct. 1910; 2 ♂, Taihorinsho, Aug. 1909, and Taihorin, Oct. 1910, coll. H. Sauter (ZMB).

Psen (Punctipsen) exaratus indicus subspec. nov.

Male. — Black, fore side of scape brownish, underside of antennae yellowish-brown. Mandibles yellowish-red with darker tips. Fore and mid femora reddish except dorsal side of basal half. Fore and mid tibiae reddish, slightly darkened on outer side.

Mandibles with vestigial tooth (Fig. 29) on ventral side, like that of *P. exaratus intermedius* Tsuneki from Okinawa. Frons and vertex slightly raised. Puncturation of frons, vertex and scutum distinct but not very strong. Propodeum on upper part of back with a number of rugae, not very strong and somewhat irregular. Antennal segments 6—13 with indistinct broad tyloidea.

Inner tooth of mid basitarsus much longer than in the males of the other four forms, nearly as long as apical tooth; an imaginative line connecting the apices of the teeth of the mid basitarsus is about parallel with the axis of the basitarsus (Fig. 28) whilst in the other subspecies these lines are distinctly diverging (Fig. 26—27). Both recurrent veins of fore wings ending in second submarginal cell. Petiole not rugose, with deep and large punctures, sides and ventral side each with two carinae. Apex of ventral side of petiole not with additional irregular rugae. Median part of second gastral sternite somewhat depressed longitudinally.

Pubescence greyish, face silvery.

Genitalia Fig. 30—31.

Length about 8—9 mm.

Female unknown.

S. India: 2 ♂ (holotype and paratype), Madras State, Anamalai Hills, Kadamparai, 3500 ft., May 1963, coll. P. Susai Nathan (ML).

The present male is easily distinguished from that of the nominate subspecies by the vestigial tooth of the mandibles and from the other forms of *P. exaratus* by the long median tooth of the mid-basitarsus.

Subgenus Mimesa Shuckard

The subgenus *Mimesa* has not yet been recorded from the Indo-Australian region. Two females collected in New Guinea during the Third Archbold Expedition in 1939 share a few important characters with palaearctic *Mimesa* (sensu De Beaumont, 1937) and they are either the first representatives of this subgenus in the Indo-Australian area or they belong to a new subgenus. The characters referred to are: the distinctly

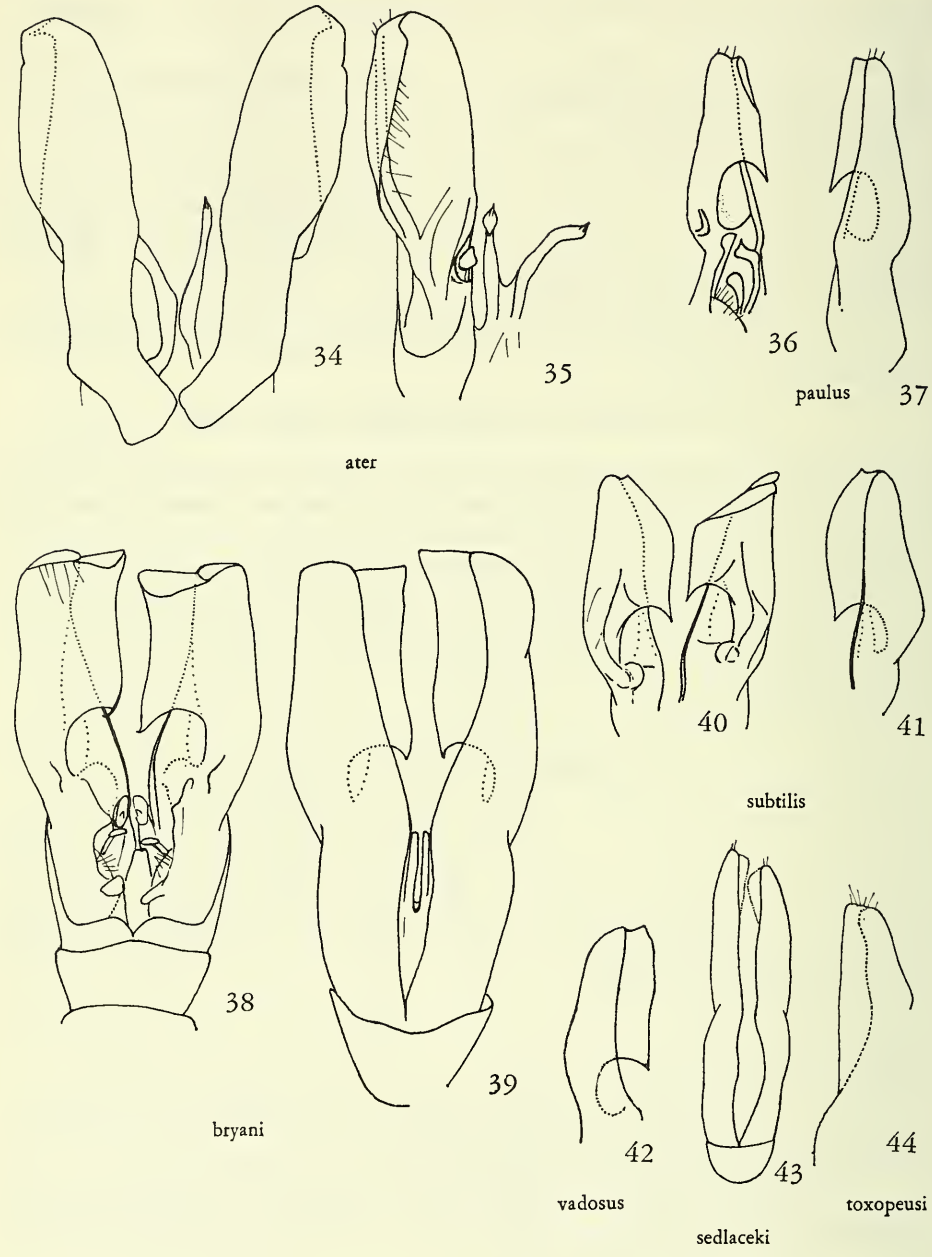


Fig. 34—44. Male genitalia of species of Indo-Australian, South Pacific and East Asiatic *Psen* s.str. 34—35, dorsal and ventral view of *P. ater* (Fabricius); 36—37, ventral and dorsal view of *P. paulus* sp.n. (left part); 38—39, ventral and dorsal view of *P. bryani* Perkins and Cheesman; 40—41, ventral and dorsal view of *P. paulus subtilis* subsp.n.; 42, dorsal view of *P. vadosus* sp.n. (right part); 43, dorsal view of *P. sedlaceki* sp.n.; 44, dorsal view of *P. toxopeusi* Van Lith (left part)

bordered epicnemial areas, the course of the epicnemial carinae, the incomplete frontal carina, and the lack of carinae connecting the antennal sclerites with the interantennal tooth.

The pygidial area is shaped as in oriental *Mimumesa,* being shining with a few punctures along the margin. The hypo-epimeral area is not carinate or punctate as in palaearctic *Mimesa,* but it is extended laterally into a right cone with the entire hypo-epimeral area as its base. The lower half of the mesopleura and the whole mesosternum are coarsely and transversely striate. The petiole is also different from that of palaearctic *Mimesa,* being long and cylindrical as in oriental *Psen* and *Mimumesa.* The longitudinal carinae of the enclosed area of the propodeum continue somewhat on the back of the propodeum, as in *Mimumesa auratus* and *tridentatus.*

Although in some details the two females also resemble the oriental species of *Mimumesa,* I prefer to relegate them provisionally in the subgenus *Mimesa,* because of the structure of the epicnemial areas and the lack of an acetabular carina.

Psen (?Mimesa) inflatus spec. nov.

Female. — Head and thorax black; head with somewhat metallic-blue shine, pronotum dorsally and notably pronotal tubercles with violet-bronze reflections, also hypo-epimeral cones somewhat bronze-coloured; propodeum with paler bronze-coloured reflections tending to brassy. Mandibles except their dark base yellowish, with dark red tips. Labrum yellowish. Palpi reddish. Scape of antennae reddish, also underside of antennae, upper side of antennae brownish. Ends of femora and the entire tibiae and tarsi reddish, hind tibiae and tarsi somewhat darkened. Spurs of tibiae yellowish-white. Tegulae reddish. Veins of wings dark brown. Petiole including ventral plate and sides of first gastral tergite dark reddish, margins of gastral tergites and of sternites 3—5 and the entire last segment reddish.

Clypeus (Fig. 24, holotype) densely punctate, median part much protruding with slight angular emargination and fine transversely striate surface. Frontal carina only distinct on lower half of frons, ending below in a tooth which in frontal view has an elliptic depression on its lower part. No carinae between this tooth and the antennal sclerites. Frons densely punctate, punctures in shallow rugae. Vertex much shining with a few distinct punctures, postocellar area not raised. Temples and cheeks almost impunctate. Antennal segments long, third segment more than four times as long as wide at apex, segments 10 and 11 at least one and one-half times as long as they are broad and last segment slightly more than twice as long as broad at base.

Scutum with strong puncturation, punctures in rows in shallow rugae. Scutellum anteriorly raised with strong punctures and a few irregular transverse carinae on its fore part; posterior part with a number of parallel longitudinal carinae. Metanotum with indistinct punctures and traces of longitudinal carinae. Enclosed area only slightly depressed, without any distinct posterior border or carina. Longitudinal carinae of enclosed area continuing on to back of propodeum, a few continuing even further until they are lost in the irregular reticulate carination on lower end of propodeum. Median two longitudinal carinae of enclosed area slightly diverging and then narrowing into the median sulcus on back of propodeum. Sides of propodeum with irregular sculpture and a few oblique carinae. Epicnemial areas shining with minute punctures, distinctly separated from interepicnemial area, which is lower. Outer epicnemial carinae not bent back-

wards. The subpleural signum forms a pointed tubercle. Interepicnemial area and mesosternum with coarse transverse, almost parallel rugae of which a few continue on to the lower part of the mesopleura. Upper half of mesopleura almost smooth. Hypoepimeral area distinctly bordered, swollen and extending laterally into a high cone, which in dorso-lateral view is as high as the length of the tegulae. Subalar area (under tegula) also somewhat swollen, its ventral side bordered by a sharp carina.

Legs normal, back of hind femora smooth and shining, hind tibiae with longitudinal row of short spines. First recurrent vein of fore wings ending near middle of second submarginal cell, second recurrent vein interstitial. Petiole cylindrical, reaching beyond hind femora when stretched. Gastral tergites and sternites with a few fine punctures, hind margin impunctate. Pygidial area (Fig. 25, holotype) elongate triangular, at base carinae bent somewhat inwards, surface smooth and shining, apical part with some fine, transversely striate sculpture, along the lateral margins a few fine punctures.

Face below antennae with golden pubescence, appressed and also with a few long erect hairs. Lower part of frons with golden pubescence, head and thorax dorsally with brownish hairs, ventral side and back of thorax with long whitish hairs. Gaster with very few hairs, in front of hind margins of sternites and of tergites 4—5 a few long and stiff hairs.

Length about 9.5 mm.

Male unknown.

Central New Guinea: 1 ♀ (holotype), Mist Camp, 1800 m, 10 Jan. 1939, 1 ♀ (paratype), Top Camp, 2100 m, 9 Febr. 1939, Neth.-Ind.—American New Guinea Expedition, coll. L. J. Toxopeus (holotype ML, paratype USNM).

Some particulars regarding the localities where this highly interesting form was collected have been published by Toxopeus (1940, 1941). The camps were on the northern side of the Nassau Range near the Sahuweri, an affluent of the Idenburg River. The climate was not favourable. At Top Camp the sun did not shine more than a few hours in the morning; it was misty in the afternoon, stormy during the night. Mist camp was even worse, the sun shining during an hour or less in the morning, the rest of the day being foggy.

List of the East Asiatic, Indo-Australian and South Pacific species of the genus *Psen* Latreille with their range of distribution

Subgenus *Psen* Latreille

Group of *ater*

P. ater (Fabricius), ♀ ♂ — Europe, Siberia, China, Mongolia, Korea, Japan
P. aurifrons Tsuneki, ♀ ♂ — Japan
P. yasumatsui Gussakovskij, ♂ — Japan

Group of *aspites*

P. aspites sp. n., ♂ — Celebes

Group of *emarginatus*

P. emarginatus Van Lith ♀ ♂ — Java, Borneo
P. dzimm Tsuneki ♀ ♂ — Japan
P. pilosus Van Lith, ♂ — Malaya
P. nepalensis sp. n., ♀ — Nepal
P. sauteri sp. n., ♀ — Formosa

Group of *curvipilosus*

P. curvipilosus Van Lith, ♀ ♂ — Java
P. lieftincki lieftincki Van Lith, ♀ ♂ — Sumatra, Malaya, ? Formosa
P. lieftincki minor Van Lith, ♀ ♂ — Malaya

Group of *tsunekii*

P. tsunekii Van Lith, ♀ ♂ — Japan
P. ussuriensis Van Lith, ♂ — Siberia
P. shirozui Tsuneki, ♂ — Formosa
P. vechti vechti Van Lith, ♀ — Java
P. vechti birmanicus Van Lith, ♀ — Burma
P. assamensis Van Lith, ♂ — India

Group of *nitidus*

P. nitidus nitidus Van Lith, ♀ ♂ — Java, Krakatau, Bangka, Sumatra, South India
P. nitidus takasago Tsuneki, ♀ ♂ — Formosa

Group of *elisabethae*

P. elisabethae elisabethae Van Lith, ♀ ♂ — Java, Sumatra
P. elisabethae auricomus Van Lith, ♀ ♂ — Malaya, Pulau Tioman
P. elisabethae madrasiensis subsp. n., ♀ ♂ — S. India
P. amboinensis Van Lith, ♀ — Ambon
P. heinrichi sp. n., ♂ — Celebes
P. regalis sp. n., ♀ — Solomon Islands
P. coriaceus Van Lith, ♀ ♂ — Philippines
P. marjoriae sp. n., ♀ — Philippines
P. novahibernicus Van Lith, ♀ ♂ — New Ireland
P. paulus paulus sp. n., ♀ ♂ — New Guinea, Papua

P. paulus baduriensis subsp. n., ♀ — New Guinea: Japen Island
P. paulus subtilis subsp. n., ♂ — Solomon Islands
P. vadosus sp. n., ♀ ♂ — Solomon Islands
P. bryani Perkins & Cheesman, ♀ ♂ — Samoa
P. cheesmanae Krombein, ♀ ♂ — New Hebrides
P. bishopi sp. n., ♀ — Solomon Islands

Group of *rufiventris*

P. rufiventris Cameron, ♀ — S. India
P. rubicundus rubicundus Van Lith, ♀ — W. Java
P. rubicundus lawuensis Van Lith, ♀ — E. Java
P. angulifrons Van Lith, ♂ — Mindanao
P. nigriventris Van Lith, ♀ — Luzon
P. richardsi Tsuneki, ♀ ♂ — Japan

Group of *orientalis*

P. terrigenus Van Lith, ♀ ♂ — Java
P. hakusanus hakusanus Tsuneki, ♀ ♂ — Japan
P. hakusanus seminitidus Van Lith, ♀ ♂ — China, Tibet, Formosa
P. koreanus koreanus Tsuneki, ♀ — Korea
P. koreanus formosensis Tsuneki, ♀ — Formosa
P. hirashimai Tsuneki, ♂ — Ryukyu Islands
P. kulingensis Van Lith, ♀ — S. China, ? Japan
P. simlensis sp. n., ♀ — N. India
P. orientalis Cameron, ♀ ♂ — India
P. affinis affinis Gussakovskij, ♀ ♂ — Siberia, Korea, Japan
P. affinis grahami Van Lith, ♀ ♂ — China
P. yomasanus Van Lith, ♀ ♂ — Burma
P. tanoi Tsuneki, ♀ ♂ — Formosa
P. fuscinervis (Cameron), ♀ ♂ — India
P. politiventris politiventris Rohwer, ♀ ♂ — Luzon
P. politiventris bellus Van Lith, ♀ — Mindanao
P. politiventris pahangensis Van Lith, ♀ — Malaya
P. alishanus Tsuneki, ♀ ♂ — Formosa
P. longicornis Tsuneki, ♂ — Formosa
P. triangulatus Van Lith, ♂ — Java, Sumatra

Group of *refractus*

P. refractus refractus Nurse, ♀ — N. India, S. India
P. refractus meridianus Van Lith, ♀ ♂ — S. India
P. krombeini Van Lith, ♀ ♂ — S. India
P. matalensis Turner, ♀ ♂ — Ceylon

Group of *aureohirtus*

P. aureohirtus aureohirtus Rohwer, ♀ ♂ — Luzon
P. aureohirtus rufopetiolatus Van Lith, ♂ — Negros
P. toxopeusi Van Lith, ♂ — Celebes
P. melanosoma Rohwer, ♂ — Philippines
P. carbonarius (Smith), ♂ — Morotai

Group of *ruficrus*

P. ruficrus Van Lith, ♀ ♂ — N.E. New Guinea, Papua

Group of *bakeri*

P. bakeri Rohwer, ♀ ♂ — Philippines
P. sedlaceki sp. n., ♂ — N.E. New Guinea

Unclassified species, probably closely related to *P. opacus*

P. opacus opacus Van Lith, ♀ — Philippines
P. opacus gressitti Tsuneki, ♀ — Ryukyu Islands
P. betremi Van Lith, ♀ ♂ — Java
P. rufoannulatus Cameron, ♀ — N. India
P. brinchangensis Van Lith, ♀ — Malaya
P. eurypygus Van Lith, ♀ — N. India

Subgenus *Punctipsen* nov.

P. exaratus exaratus (Eversmann), ♀ ♂ — W. Europe, Caucasus, Siberia, Korea, Japan
P. exaratus santoro Yasumatsu, ♀ ♂ — Ryukyu Islands
P. exaratus intermedius Tsuneki, ♂ — Ryukyu Islands
P. exaratus taiwanus Tsuneki, ♀ ♂ — Formosa
P. exaratus indicus subsp. n., ♂ — S. India

Subgenus *Mimumesa* Malloch

P. dahlbomi pacificus Tsuneki, ♀ ♂ — Japan
P. atratinus longulus (Gussakovskij), ♀ ♂ — Ussuri region, Japan
P. vanlithi Tsuneki, ♀ ♂ — Japan
P. littoralis (Bondroit), ♀ ♂ — Palaearctic region, including Japan
P. kashmirensis Nurse, ♀ ♂ — Kashmir
P. petiolatus Smith, ♀ — Misool or Celebes
P. tridentatus tridentatus Van Lith, ♀ — Sumatra, Malaya
P. tridentatus chrysomallus Van Lith, ♂ — Burma
P. auratus mindoroensis Van Lith, ♀ — Mindoro
P. auratus auratus Van Lith, ♀ — Java, Bali, ? Sumatra
P. auratus multipunctatus Van Lith, ♀ — Negros, Luzon
P. auratus miltoni Van Lith, ♀ ♂ — Malaya

Subgenus *Mimesa* Shuckard

P. equestris (Fabricius), ♀ ♂ — Palaearctic region, including Sakhalin
P. lutarius japonicus (Péréz), ♀ ♂ — Japan
P. lutarius dispar Gussakovskij, ♀ ♂ — Manchuria, Kamschatka
?*P. filippovi* Gussakovskij, ♀ — ? E. China

? Subgenus *Mimesa* Shuckard

P. inflatus sp. n., ♀ — New Guinea

Subgenus *Pseneo* Malloch

P. townesi Van Lith, ♀ — Luzon

Subgenus *Odontopsen* Tsuneki

P. hanedai Tsuneki, ♀ ♂ — Japan

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A REVIEW OF THE GENUS OLIGOAESCHNA SELYS IN SOUTHEAST ASIA

by

M. A. LIEFTINCK

Rijksmuseum van Natuurlijke Historie, Leiden

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INTRODUCTION

In this paper I have attempted to characterize anew all the species of *Oligoaeschna* at present known. While preparing keys for the identification of both sexes, I found that they could be arranged in two sections which seem to indicate more or less the natural affinities within the genus. It was deemed necessary from the outset to consult the types of a number of neglected or insufficiently defined species which for some reason or other had been placed into the synonymy of earlier described taxa. I have been fortunate in the opportunities provided for examining not only the types of a large proportion of the species already known but also to include descriptions and illustrations of new taxa based on a rich material accumulated since last reporting on the genus (Lieftinck, 1940). I am nevertheless convinced that our present knowledge of *Oligoaeschna* is only fragmentary, the genus being probably a large one. It is to be expected that species still to be discovered will bridge the gap between the two sections and clear up the dark points in our understanding of their affinity and distribution.

There are still a few species known only from solitary females. These I have left unnamed, but in order to make this review as complete as possible and to facilitate future recognition, I have included all of them in the key, treating them separately as "spec. indet. A—D".

CENSUS OF MATERIAL AND ACKNOWLEDGEMENTS

For the present revision I have had the opportunity to study 72 specimens representing 23 recognizable species, 4 of which (all in the Leiden Museum) being left unnamed by the absence of a male. The bulk of the available material (41 specimens representing 15 species) is deposited in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden (ML). Other individuals, originally in the Selys and Martin collections, were examined by me in the Institut royal des Sciences Naturelles at Brussels (IRSN) and the Muséum National d'Histoire Naturelle in Paris (MP).

I wish to acknowledge the assistance of the following persons who devoted time and trouble to supply material that will, I hope, largely enhance the value of this paper. My best thanks are due to Messrs. S. Asahina and K. Miyakawa for the gift of Japanese examples of *O. pryeri* and the loan of the types of *O. pyanan* Asahina in the former's collection (CSA). Dr. I. J. Cantrall, of the Michigan Museum, Ann Arbor (AAM) allowed me to examine Foerster's types of *O. amata, buehri* and *venatrix* while Dr. K. K. Günther, of the Institut für Spezielle Zoologie und Zoologisches Museum der Humboldt Universität, Berlin (ZMB), rendered the same service with respect to the types of *O. poeciloptera* (Karsch). Dott. Delfa Guiglia and Aldo Margiocco, of the Museo Civico di Storia Naturale, Genova (MCG) kindly supplied a wing-photograph of the type of *O. modiglianii* Selys; Messrs. E. Taylor, of the Hope Department of Entomology, Oxford (OUM), and D. E. Kimmins, of the British Museum (Nat. Hist.), London (BM), gave me access to the late F. C. Fraser collection and allowed me to incorporate in this paper all unstudied material under their supervision. Lastly, Dr. L. L. Pechuman, of Cornell University, Ithaca (CU), kindly arranged for the type of *O. zambo* Needham & Gyger to be examined by me.

Classification of the Gomphaeschninae

The earliest classifications of the Aeschnidae outlined by Karsch (1891) and later authors were analysed and commented upon in great detail by Walker (1912 : 16—25), who further explained the possible relationships within this family (or subfamily, as he understood it). As to the affinity of *Oligoaeschna* with other genera, Karsch duly recognized its alliance with such genera as *Fonscolombia* Selys (= *Boyeria* MacLachlan) and *Allopetalia* Selys, which were therefore placed together in his "Gruppe IV. *Allopetalia* Selys". Walker's views were adopted by Tillyard (1916 : 11), who was the first to propose a tribal division of the subfamily Aeshninae, now given family rank. Tillyard erected the tribe Brachytrini for two series called by him the "*Boyeria* Series" (with unforked radial sector) and the "*Brachytron* Series" (with the vein *Rs* symmetrically forked). In the first series he associated *Jagoria* with *Allopetalia* Selys, *Gomphaeschna* Selys, *Linaeschna* Martin, and *Boyeria* MacLachlan. This system was followed in general by Fraser (1940 : 375—376), except that a "Section Brachytridi" was instituted for the reception of three new subfamilies, the Brachytrinae, Neopetalinae and Gomphaeshninae. Disregarding the superfluous "Brachytridi", I am of the opinion that these units can stand, only the last two misspelt names should be corrected into Neopetaliinae and Gomphaeschninae. *Oligoaeschna* finds its place in the last-mentioned subfamily along with all other described genera possessing an unbranched radial sector: *Basiaeschna* and *Hoplonaeschna* Karsch, which had remained in Walker's "*Aeschna* Series", now being also included. In the revised Reclassification, Fraser (1957) finally instituted a "Division Brachytrini", which comprises the same subfamilies as those proposed by him earlier. It should be mentioned, however, that whereas *Oligoaeschna* was correctly included in the Gomphaeschninae, its synonym *Jagoria* here appears as a member of the Brachytrinae! Leaving the question undecided whether *Basiaeschna* and *Hoplonaeschna* would not be better removed from the Gomphaeschninae and again transferred to the Aeshninae as the most primitive members of these, I believe for the present that Fraser's arrangement is the most convenient and natural one.

Immature stages

As to the early stages of the Gomphaeschninae, reference should be made to a number of publications dealing with the last instar larva or exuviae of these forms. Unfortunately the only species of *Oligoaeschna* known also in the larval stage is *O. pryeri* (Martin), from Japan (see under that species), no examples of the *O. poecilopteta* section corresponding with this type having been discovered so far in Malaysia or elsewhere in the tropics. Its most characteristic features are (1) prominent postocular lobes carrying striate grooves; (2) very long 7-segmented antennae; (3) broad and conspicuous labrum; (4) short and broad prementum with well-marked (though closed) median cleft, abruptly truncated palpus and very short movable hook; and (5) small anal pyramid with very long epiproct (Asahina, 1958).

Of the four other genera placed in the subfamily, the early stages of *Allopetalia* and *Linaeschna* are still unknown. However, the larva of *Gomphaeschna* was described by Kennedy (1936, young stages), Needham & Westfall (1955) and Walker (1958), while of *Boyeria* good descriptions are to be found in the literature on Palearctic and North American Odonata. The fullest and best illustrated accounts of *Boyeria* are those supplied by Asahina (1939) on the Japanese *B. maclachlani* (Selys), by Erich Schmidt (1950) for

the European *B. irene* (Fonsc.), and by Walker (1958) for the Nearctic species.

Of the last two genera, only *Gomphaeschna* seems to show some points of resemblance with *Oligoaeschna.* Characters shared by both are the very broad labrum and the unusually long antennae. In *Gomphaeschna* the latter are, however, 6-segmented and the length ratio of the separate segments is also different in the two. There are apparently no other features which the two genera have in common, the corresponding parts of the labium and anal pyramid of *Gomphaeschna furcillata* (Say) figured by Walker (1958, pl. 64) being so unlike those of *Oligoaeschna pryeri* illustrated by Asahina (1958), that no conclusions can be drawn from a comparison of these structures.

Fossil history

The geological record, summarized by Esaki & Asahina (1957), indicates that the Gomphaeschninae are of old standing. They were flourishing in early Tertiary times, taking shape in the Oligocene or even much earlier. Campion (1916), referring to Needham (1907) who redescribed the type of *Morbaeschna muensteri* (Germar), points out that Germar's type originates from the lithographic slates of Bavaria. In view of the fact that this dragonfly shows a venation comparable with that of the North American *Gomphaeschna,* and assuming the wing venation to be correctly interpreted, the same author argues that this discovery would carry the history of the Gomphaeschninae well back into Mesozoic (Jurassic) times. Nevertheless far more advanced Aeshnidae (e.g. *Triaeschna* Campion and, doubtfully, true *Aeshna* F.) were already present, respectively in the Eocene of Bournemouth (Campion, 1916) and the Lower Miocene beds of Florissant (Cockerell, 1913). It is evident also that the described Miocene genera with unbranched radial sector already exhibited a great diversity in other venational characters, so much so in fact that the qualities of these as criteria for generic distinction are difficult to estimate. On the other hand it would seem that Cockerell (1907, 1913), while attempting to differentiate between a number of fossil and recent Aeshnid genera, used many characters which are of specific rather than generic value. On comparing the venation of species representing different sections of *Oligoaeschna* (Pl. 12 and 13), it will be seen that interspecific variation can be considerable, even within the limits of a single genus, several of the above characters being manifest also in various combinations in our present-day species. It would appear, therefore, that little can be said about the interrelationship of these fossil genera as long as the differences are based only on impressions of wing fragments.

The middle portion of a fore wing of *Oligoaeschna* from the Upper Pliocene in Japan was provisionally referred by Esaki & Asahina (1957) to the recent Japanese species *O. pryeri* (Martin); it may be pointed out, however, that this cannot be true since the photograph of this fragment clearly shows two cell-rows M_4-*Mspl*, whereas *O. pryeri* has only one.

Synopsis of the genus *Oligoaeschna* Selys

Oligoaeschna Selys

Oligoaeschna Selys, 1889 (14.VIII-4.IX): 470—471, fig. (diagn.); type-species: *O. modiglianii* Selys, 1889 (monobasic). — Kirby, 1890: 86 (monobasic). — Cockerell, 1913: 579 (key). — Cowley, 1934: 245 (nomenclature). — Needham & Gyger, 1937: 39 (key), 40.

Jagoria Karsch, 1889 (1.VIII): 238 (key), 238—239 (diagn.); type-species: *J. poeciloptera* Karsch,

1889 (monobasic); Karsch, 1891: 277, 284, 289 (key). — Kirby, 1890: 91 (monobasic). — Martin, 1908: 6 (key), 1909: 130 (diagn.); Martin, 1911: 7 (key), 17—18 (diagn.). — Laidlaw, 1923: 5—6, 8 (key). — Cowley, 1934: 245 (nom. preocc.). — Fraser, 1936: 55 (key), 57—58 (diagn.); Fraser, 1957: 98 (in subfam. Brachytrinae).

Dolaeschna Needham, 1907: 142—143 (diagn.); type-species: *D. elacatura* Needham, 1907 (monobasic).

Oligoaeshna Fraser *in* Tillyard & Fraser, 1940: 376; Fraser, 1957: 97 (in subfam. Gomphaeshninae).

Type-species: *Oligoaeschna modiglianii* Selys.

As pointed out by Cowley (1934), the generic name *Jagoria* Karsch must be substituted by *Oligoaeschna* Selys, because the former is preoccupied by *Jagoria* Strahl, 1862, in Crustacea. The emended spelling used by Fraser is invalid and this applies to all other derivatives of the name *Aeshna* except, of course, to the superspecific taxa.

The fullest characterizations of the genus are those given by Karsch (1889, 1891) and Needham (1907, sub *Dolaeschna*) and need not be repeated here. All necessary amplifications can be derived from the present account in which new and already described species are characterized and figured.

Group characters and general remarks on the morphology

As will appear from the following keys and illustrations, the genus can be conveniently divided into two fairly well defined sections.

The first section comprises five brightly coloured species exhibiting a heliochromatic colour pattern which have, moreover, probably all of them diurnal habits. The members of this group are spread discontinuously over a large part of north-temperate Asia, three being known from the eastern Himalayas (Sikkim and Assam), while two others occur much farther to the east, one in the islands of the Japanese empire and a near ally in the high mountains of Taiwan. It will be seen that two continental species are still insufficiently known, and although no single *Oligoaeschna* has yet been found in the intervening region, it seems beyond doubt that all are closely interrelated. The best known member of this first category is the Japanese *O. pryeri* (Martin).

The species of the second section are more numerous and much better known. They are less contrastingly coloured, resembling the Gynacanthinae not only in their sombre, hylo- or aphantochromatic colour design but also in habits, all being strictly crepuscular. They are forest-haunting dragonflies having a more southerly, tropical distribution. One is found in Hainan while the remainder occur in the Malay Peninsula, the Great Sunda islands, the Philippines and Celebes. Representatives of this second species-group are *O. poeciloptera* (Karsch) — the type-species of *Jagoria* Karsch — and *O. modiglianii* Selys — the type-species of *Oligoaeschna* Selys.

Each of these two sections can be further divided in two groups based on the venation, one comprising species with only a single cell-row M_4-*Mspl*, and a second which possesses two rows, at least so in the hind wing. It will be seen that, although this feature does not necessarily reflect relationship, it has proved to be quite constant, so that it can be safely relied upon as a means of specific differentiation. Remarkably enough, duplication of cells in this space is not always correlated with an increase of cells in other spaces or areas of the wing.

Special attention should be drawn to the female cerci, whose form differs widely in the two sections of *Oligoaeschna*. While being short and inconspicuous in the *O. pryeri* group, they have attained great length in all members of the *O. poeciloptera* assemblage,

resembling slenderly stalked paddles. The significance of these filamentous processes is not clear. During the maturation period they may serve the purpose of sex recognition when mixed populations are engaged in feeding flights or later, as the sexes meet at the breeding site; but there can be no doubt that they become functionless soon after copulation is accomplished. It is well known among taxonomists that the appendages are very rarely found intact in matured females. They become damaged and lost either during copulation, when they are presumably nibbled off by the male, or in oviposition, when the cerci apparently get in the way and are soon fractured off.

Apart from the more striking key characters, the form of the auricles at the 2nd abdominal segment of the male also separates the two sections. These organs are briefly stated in the key to be either "rounded" or "angular", expressions which need explanation. In all species so far known of the *O. pryeri* group, the hinder angles of the auricles are evenly rounded and the posterior margin is furnished with numerous conical black tubercles which are crowded together and directed inward. In the members of the *O. poeciloptera* group, on the other hand, the auricles are rather more triangular with prominent postero-distal angle, the hind margin being armed with fewer (12—20) and less closely set but sharply acute, incurved spinules.

Lastly, there is some evidence that the two sections differ in the length of the legs, the femora in the *O. poeciloptera* group being relatively shorter than they are in *O. pryeri* and allies. With a better knowledge of the last-mentioned species group it may ultimately prove possible and more convenient to split up *Oligoaeschna* in two subgenera, when characters are amplified from other organs. The two sections are admittedly very different.

DISTRIBUTION

As will be seen from the table, the two categories also differ in the extension of their range, the diurnal species having a more northern distribution than the majority inhabiting tropical countries. Though several species of the last group are probably more widely distributed than here recorded for them, the accumulation and great diversity of forms in the little explored island of Borneo is decidedly striking. On the other hand, the absence of any member in Java, doubtless the most thoroughly investigated island of the entire archipelago, seems equally remarkable. The most probable explanation for these phenomena is that all species are limited in their distribution by the nature of their habitat, the presence of suitable breeding places being essential for their development. These do not exist any more in over-cultivated Java, whereas the immense plains of Borneo, with their numerous river systems, forest-marshes and bogs on peaty soil, very likely provide excellent conditions for adult and larval life. Similar habitats are still present also in many parts of West Sumatra and to a less extent in the Malay Peninsula — not to mention Indochina — so that there too we may expect many more species to turn up sooner or later.

RELATIONSHIP

Oligoaeschna seems to have as its closest relative the peculiar *Linaeschna polli* Martin (1909), a very rare archaic-looking dragonfly endemic in Borneo. Though admittedly belonging to the same primitive group of recent Aeshnidae, *Linaeschna* shows many specializations of its own. Judging from the venation, it is far more advanced than any

Oligoaeschna species	Section *O. pryeri* (Martin)					Section *O. poeciloptera* (Karsch)									
	Sikkim	Assam	Taiwan	Ryukyu Is.	Japan	Hainan	Malaya	Sumatra	Nias	Mentawei	Borneo	Luzon, P.I.	Mindanao, P.I.	Celebes	Buton
martini	+														
khasiana		+													
decorata		+													
pyanan			+												
pryeri				+	+										
petalura						+									
uropetala								+		?					
foliacea								?			+				
elacatura											+				
venusta											+				
modiglianii									+						
platyura											+				
spec. indet. A											+				
spec. indet. B											+				
amata							+				+				
mutata											+				
sumatrana								+							
buehri								+			+				
spec. indet. C											+				
spec. indet. D											+				
poeciloptera												+			
zambo													+		
venatrix														+	+
Total	1	2	1	1	1	1	1	4	1	1	11	1	1	1	1

member of the *O. poeciloptera* branch of *Oligoaeschna* in southeast Asia.

Structurally the two genera have many features in common but *Linaeschna* has a much denser venation while the protective aphantochromatic colour design has reached the highest degree of perfection in this form. The type, a male in the Leiden Museum portrayed by Martin (1909), is unique and the female is unknown. Another, more remotely allied genus is *Gomphaeschna* Selys, with two diurnal species in North America. These are smaller-sized dragonflies with reduced venation, superficially resembling *O. pryeri* and allies, but *Gomphaeschna* differs from these in a number of important characters. For full particulars, see Walker (1958).

Bionomics

For notes on the life-history of the diurnal species of the genus see under *O. pryeri* (Martin). Owing to their retiring habits little can be said about the bionomics of the tropical members of *Oligoaeschna*. Most individuals in our collection from Sumatra and Borneo were beaten up during the day from their resting places in deep jungle. Others,

evidently attracted to artificial light during the evening, were collected in houses and verandahs. As far as I know all species are crepuscular or even nocturnal and the dull colours are in keeping with these habits. They do not appear on the wing until dusk and during the maturation period assemble in forest clearings towards sunset, hawking for food and mixing up with other crespuscular aeshnids. In July, 1953, while on a collecting trip in the lowlands of southern Borneo, I witnessed feeding flights of *Oligoaeschna* near Pemantan, in the Sampit district. On two evenings about half an hour before sundown swarms of immature aeshnids, mostly *Heliaeschna* and *Gynacantha* suddenly came out of the forest near the river bank and assembled in small flocks above bushes and isolated treelets. They indulged in swift erratic flights chasing mosquitoes. Some large-sized *Heliaeschna* were recognized by the dark brown patches on their wings while one or two females of *Oligoaeschna* could be told apart by their small size and exceedingly long spatulate appendages silhouetted against the evening sky. Unfortunately, on both occasions the dragonflies were flying too high to come within reach of my net, so that none could be captured. There is much evidence that these insects had emerged only few days before the above observations were made; and also, that their breeding places were the small bog pools which occurred plentifully in the peat-bottomed marshes of the nearby forest.

KEY TO THE SPECIES

(The males of *O. decorata, elacatura, modiglianii* and *poeciloptera* are entirely or partly unknown; the females of five other species are likewise unknown; see separate key).

1. Frons with thick black T-spot superiorly, the stem short and attached to a preocular band, the head very heavy and often connected laterally with the basal band so as to enclose (or almost so) a pair of wide transverse green dorsal spots, one on each side of the T-stem. Frons of head wider and less protuberant, eyes smaller: diameter of head across eyes less than twice the width of frons; interorbital suture little or no longer than occipital triangle (Fig. 2). Posterior femur relatively long, little shorter than synthorax (10 : 11.4). Auricles rounded. Body pattern heliochromatic: ground colour warm brown to deep black marked conspicuously with yellow, green and/or blue. Male superior appendages not greatly expanded or leaf-like, about 3 mm long, inner (mesal) face of each with wide crescent-shaped antemedian emargination. (Male of *O. decorata* unknown). Female appendages (cerci) short, subequal in length to 10th abdominal segment. Venation less dense; cross-veins in supratriangle (*ht*) nearly always wanting. One row of cells *Rs-Rspl* on all wings. Group of *O. pryeri* (Martin) 2

— Frons dark greenish to uniform brown, frontal crest and anterior surface often partly or wholly obscured but not forming a well-marked black T-spot above. Front of head narrower and more protuberant, eyes larger: diameter of head across eyes usually more than twice the width of frons; interorbital suture distinctly longer than occipital triangle (Fig. 4). Posterior femur markedly shorter than synthorax (10 : 12—13). Auricles angular. Body pattern hylo- or aphantochromatic: ground colour various shades of brown, markings yellow-brown to olive-green, less vivid and frequently obsolete or obscured (especially on abdomen) but lateral thoracic bands often conspicuous. Male appendages variable, frequently expanded and leaf-like. Female appendages (cerci) considerably longer than segment 9 + 10, slenderly stalked and

often greatly expanded apically. Venation generally closer; one or more cross-veins in supratriangle (*ht*) nearly always present. One (rarely two) rows of cells *Rs-Rspl* on all wings. Group of *O. poeciloptera* (Karsch) 6

2. Labrum, whole clypeus, and a stripe bordering the frons anteriorly, pale-coloured. Pterostigma shorter, 2.0—2.2 mm 3

— Labrum and anteclypeus deep black, postclypeus bright green or chrome bordered with black anteriorly; frons in front of the crest deep black except a yellow band along clypeal suture. Anal angle of male hind wing well pronounced, subrectangular. Pterostigma larger, 2.9—3.7 mm. Basal abdominal segments of either sex considerably inflated in both dimensions, almost as broad as the thorax; abdomen, after a well-marked subbasal constriction of 3, rather strongly (♂) or slightly (♀) expanded as far as the end of 5, then decreasing in width posteriorly, constricted at 8—9 and finally again a little broadened and parallel-sided as far as the end of 10. All coloured bands and spots sharply marked off from the dark ground colour; additional AD and MD present on dorsum of segm. 2. Anal area of ♀ hind wing with only 3 cells bordering cubital space proximal to anal loop 5

3. Two rows of cells M_4-*Mspl* in both pairs of wings. — Male (description after Navas). Superior appendages long and slender, rod-like, unarmed; in dorsal view at first slightly outbent, then gently incurved, each subparallel-sided in proximal two-thirds, then gradually expanded with obtusely pointed tips; in profile similar but almost straight and somewhat broadened beyond middle, apex obtuse. Inferior appendage ⅔ length of superior pair, about twice longer than broad and only little narrowed towards apex, which is bilobed (Fig. 1, after Navas). Anal angle of hind wing well pronounced, rectangulate, inner border slightly incurved beyond triangle (Fig. 1, id.). Pterostigma black. Membranula brown with fine pale line bordering the nervures. Thorax black with broad green dorsal bands interrupted above so as to form thick exclamation marks; sides with broad meso- and metepimeral green bands, the former rounded above, the latter irregular and widest ventrally. Legs wholly black. Basal abdominal segments strongly inflated dorsoventrally, 3 sharply constricted, thereafter segments gradually narrowed towards apex. Colour including appendages black, pale markings reduced: auricles orange-yellow basally; tergites with paired subtriangular (blue?) PD and smaller MD. — Female (description after Laidlaw). Abdomen constricted sharply at segm. 3, widened again from 4 to 6, the remainder narrow; dorsum of 2—6 each with paired semilunar apical spots, very small on 6, and 2—4 each with pair of small transverse medio-dorsal spots, 2 moreover with minute basal triangle of green (AD). Anal appendages small, about 2 mm long. Dentigerous plate almost squarely truncate posteriorly, with about 15 irregularly placed ventro-apical teeth. High mountain species of E. Himalaya (Darjeeling district) . . . . . **martini**

— Only a single row of cells M_4-*Mspl* in both pairs of wings 4

4. Male only. Labrum orangish, clypeus (and frons anteriorly) green; arms of T-spot on dorsal surface of frons not curving back to eye-margin, hence transverse green spots not quite isolated. Synthorax dark reddish-brown with complete broad, green antehumeral bands curving a little outward in front of the antealar triangles. No trace of juxtahumeral pale spot but dorsal triangular metepisternal green spot present in addition to the two lateral bands. Anal angle of hind wing poorly indicated, obtuse-angulate (Fig. 3); pterostigma black; membranula dark grey, lighter along anal vein.

Abdominal segments 1—2 inflated, but less so than in *O. pryeri* and *pyanan*, measuring 3.6 and 3.9 mm, respectively, across apex of 1 and auricles of 2; segm. 3 very slightly constricted (2.4 mm), abdomen from there on increasing in breadth to 2.9 mm as far as end of 4, then decreasing gradually to end of 8 (width 1.3 mm) and finally again slightly broadened; segm. 10 parallel-sided. Only segm. 3—7 with well developed middorsal carina. Markings very similar in arrangement to those of *O. pryeri* and *pyanan* though smaller and paired green PD of 2—7 more closely approximated, separated from each other only by the black dorsal carina. Distal half of superior appendages narrower and straighter than in either *pryeri* and *pyanan* but, like these, with proximal half distinctly emarginate between two angular projections. Inferior appendage about half length of superior pair, apical branches slightly diverging and separated by a triangular emargination (Fig. 2). Female unknown. Hab.: Mountains of N. Assam . . . . . **khasiana**

— Female only (Pl. 12). Head markings as in *O. khasiana* but black frontal marks less heavy and ground colour of frons pale chrome instead of green. Synthorax lighter brown, antehumeral bands reduced to tiny blue-green streaks, incomplete and tapering upwards, where they are well separated from a transverse oval spot placed in front of the ante-alar triangles; lateral thoracic bands broad and parallel-sided, bright chrome; no traces of intermediate pale spots. Basal half of fore and hind wings palely and diffusely saffronated, anal area subhyaline; pterostigma black, a little longer than in *O. khasiana*; membranula light grey. Abdomen not unusually inflated basally, succeeding segments cylindrical and 3—10 with well developed middorsal carina. Colour light brown growing darker posteriorly, apical segments almost black; 1—7 conspicuously marked with chrome: 1—2, in addition to very broad uninterrupted lateral bands, with complete middorsal longitudinal stripes, the one on 2 twice constricted; 3—6 each with paired triangular MD and much larger, still more closely approximated subrectangular PD, the former decreasing in size posteriorly (vestigial on 6), the latter also present on 7 and of equal size on all segments, each finely split into two by a dark line at the dorsal crest. On 3—5 PD send off unpaired sagittate forward prolongations nearly touching MD and widest on 3, while 3—8 carry in addition narrow middorsal stripes (AD), successively shorter from before backwards but on 3—5 extending from base as far as the transverse carina. Sides of segm. 3—9 with distinct AC, ML and PL, all fused together and band-like on 3, subinterrupted and undulated on succeeding segments, PL being absent only on 6 and 7. Dorsum of 9—10, appendages and styli black; valves brown. Epiproct tongue-shaped, apparently fused together with paraproct and directed straight backward; anal appendages (cerci) only little longer (1.5 mm), straight and lanceolate, slightly swollen basally, then flattened and bluntly pointed (Fig. 2). Male unknown. Hab.: Mountains of N. Assam . . . . . **decorata**

5. Only a single row of cells M_4-*Mspl* on all wings, or at most 1—4 irregularly divided cells in hind wing. Membranula almost white. Male superior appendages in dorsal view slightly incurved, markedly expanded in distal half, forming spatulate blades with blunt tips; dorsal margin in profile perfectly straight; inner face of antemedian portion with wide crescent-shaped emargination preceded by a strong ventral tooth. Inferior appendage only little longer than its width at base, apex broadly emarginate. Body markings conspicuous, at least traces of a juxta-humeral inferior spot and an irregular pale metepisternal stripe in addition to the broad lateral thoracic bands.

Paired PD spots on abdominal segments 2—7 triangular, the black space separating them shaped like an inverted triangle. Hab.: Japanese islands and northernmost Ryukyus . . . . . **pryeri**

— Two rows of cells M_4-*Mspl* on all wings. Membranula dark grey. Male superior appendages in dorsal view more nearly forcipate, narrower and more aslant, about five times longer than broad and with acute tips; dorsal margin in profile distinctly convex; inner face of antemedian portion with well pronounced crescent-shaped emargination preceded by a small tooth-like ventral projection. Inferior appendage relatively broad, about ⅔ length of superior pair, terminating in a pair of widely divaricate branches (Fig. 3). Body markings similar to *O. pryeri* but smaller, no juxtahumeral pale spot and traces only of lateral metepisternal pale stripe. Paired PD spots present only on abdominal segments 2—6, placed transversely and nearly meeting at the middorsal carina; 7—10 wholly black. Hab.: Taiwan . . **pyanan**

6. Fore and hind wings with blackish-brown anterobasal spot extending almost to level of arculus (Ax_1-Ax_2); bases posterior to $Cu + A$ hyaline. Two rows of cells *Rs-Rspl* in fore wing, two cell-rows M_4-*Mspl* on all wings and three cells between M_2-*Rs* where these veins are most widely separated. Cu_1 and Cu_2 in hind wing distinctly anteriorly convex. Anal angle of hind wing sharply pronounced, acute-angulate, inner border beyond triangle slightly emarginate. Pterostigma clear ochreous (Pl. 13). Legs blackish brown. Basal abdominal segments moderately inflated, intermediate segments, after distinct subbasal constriction of 3, gradually expanded, widest (3.6 mm) and parallel-sided across 4—5, then again a little narrowed as far as apex of 8. Extreme base of 4—7 with tiny constriction, the lateral tergal margins being abruptly incurved and the ventral carinae sinuate; 9 and 10 subparallel-sided, 9 about ⅓ longer than 10; length-breadth ratio of segm. 9 as 10 : 7.4 approx., the same of segm. 10 as 9 : 10. Segment 10 not inflated, surface but slightly convex, transversely striate, disk covered with numerous erect, backwardly directed denticles. Superior appendages 5.0 mm long, inner and outer margins of disk lying in a plane oblique to dorsal line of vision (Fig. 6). Female unknown. Hab.: Borneo . **venusta**

— Wing bases at most diffusely yellow, lacking opaque dark spots. Invariably a single row of cells *Rs-Rspl* on all wings and only two cells between M_2-*Rs* where these veins are most widely separated. Abdominal segments 4—9 not unusually constricted at extreme base 7

7. Two rows of cells M_4-*Mspl* on all wings. Male superior appendages flat and spatulate, placed horizontally, less than four times as long as their maximum width; inferior appendage only little shorter than superior pair, with converging sides, apex narrow and slightly notched. Thorax brown marked with dark olive-green dorsal bands, incomplete above, and a pair of transverse spots of same colour in front of the ante-alar triangles; sides with broad meso- and metepimeral coloured bands. Legs black, femora for the greater part reddish brown. Pterostigma dark ochreous. Abdomen spindle-shaped, basal segments moderately inflated, 3 markedly constricted, succeeding segments gradually expanded, widest (3.3 mm) at middle or apex of 5, then narrowed as far as apex of 8 and finally again slightly expanded to end of 9; segm. 9 about ¼ longer than 10, which is subquadrangular and parallel-sided; 10 rather inflated, distinctly convex dorsally, distal half longitudinally sulcate and disk finely denticulate. (Male terminalia of *O. modiglianii* and *poeciloptera* (Pl. 12) unknown). Lowland species of the Malay Archipelago 8

— Only a single row of cells M_4-*Mspl* on all wings, or at most 1—2 irregularly divided cells in hind wing only 9

8. Anal angle of male hind wing acute, inner border slightly concave beyond anal triangle (Fig. 5). Abdominal segments 3—7 with well developed denticulate middorsal crest, carina of 8 replaced by a longitudinal area of denticles upon distal half of tergite. Disk of 10th segment covered with numerous closely set denticles. Superior appendages gradually broadened towards apex; sides of inferior appendage straight (Fig. 5). Female resembling the male but abdomen more strongly spindle-shaped, widest across 4—5, attaining more than twice the width of the constriction at 3. Wing membrane light yellow except along posterior margin in anal and postnodal areas. Cerci incomplete; dentigerous plate with 18—20 teeth (Fig. 7). Hab.: Borneo . . . . . **platyura**

— Anal angle of male hind wing obtuse, inner border beyond anal triangle straight (Fig. 5). Abdominal segments 3—8 with well developed median crest, denticles obliterated. Disk of 10th segment covered with fewer and more widely spaced denticles. Superior appendages more or less stalked and more abruptly expanded apically; inferior appendage more slender, its sides slightly concave (Fig. 5). Female unknown. Hab.: Philippine Is. (Mindanao) . . . . . **zambo**

9. Male superior appendages slender, about 4.5 mm long, ribbon-like, proximal half in dorsal view converging and downcurved, then rather abruptly angulate, a little outcurved and directed caudad, apex broadly rounded; inferior appendage about half length of superior pair, apex triangularly excised (Fig. 11). Anal angle of hind wing sharply pronounced, acute-angulate and somewhat produced inward but inner border beyond triangle straight. Membrane flavescent; pterostigma light ochreous. Body dark brown, summit and whole anterior face of frons blackish brown, upper surface with indistinct transverse greenish-brown stripe and a pair of lighter green streaks, one on each side. Thorax and basal abdominal segments 1—2 spotted and banded with green and yellow; small transverse paired green PD only on 3—7 (or 3—8), MD unapparent, these tergites laterally marked lengthwise with ochreous spots. Legs blackish brown, femora chestnut, except towards apices. Abdomen with basal segments moderately inflated, intermediate segments, after distinct subbasal constriction of 3, gradually expanded, widest across 5—6 (3 mm), thereafter segments again slightly decreasing in width; middorsal carina of 7—10 poorly indicated or wanting; segm. 10 only about half as long as 9, dorsal surface raised, denticles on summit of disk not very numerous, apical one-fourth depressed on either side close to posterior border. Female similar to male; wings deeply stained with brownish yellow, this colour in fore wing palest and ill-defined, extending outwards to proximal side of triangle and in subcostal space to nodus, in hind wing covering whole surface as far out as nodus and contrastingly outlined right across wing; cerci almost 11 mm long, slenderly stalked with spatulate tip (Fig. 11). Hab.: Buton I. and Celebes . . **venatrix**

— Male superior appendages shaped differently and remaining characters combined not as above. Synthorax with pair of oblique, elongate, dark green dorsal bands, incomplete on either end, and a pair of transverse oval spots placed in front of antealar triangles. Abdomen 2—7 with paired transverse green MD streaks and somewhat larger transverse or crescent-shaped PD spots (Male of *O. elacatura* unknown) 10

10. Male superior appendages aslant and slightly twisted: inner edges of expanded por-

tions hanging well below level of outer edges in natural position; basal inferior tooth wanting. Both sexes with abdomen at least slightly spindle-shaped; basal segments moderately inflated and 3 markedly constricted subbasally, greatest width at base of 5; middorsal carina of 8—9 replaced by a series of warts, variable in number; male segm. 9 at least 1½ times longer than 10, the latter broader than long, not markedly swollen or arched dorsally, its disk coated with rasp-like denticles. Anal angle of male hind wing sharply pronounced. Cerci of female long and stalked, strongly expanded apically 11

— Male superior appendages more nearly horizontal in natural position: inner and outer edges of expanded portions lying in approximately the same plane; if placed obliquely, then the appendages are not downcurved; basal inferior tooth present or absent. Abdominal segment 10 usually heavier and noticeably convex dorsally (Males) 12

11. Male superior appendages slightly less than four times as long as their maximum width, swollen longitudinal ridge scarcely sinuate; outer margin of each in profile strongly arched and inner (mesal) border of distally expanded shelf distinctly angulate. Inferior appendage broader, its sides rather convex but apical branches outcurved (Fig. 6). Body including legs not very dark, light to dark reddish brown, femora obscured distally. Lateral thoracic meso- and metepimeral bands yellowish to dark green, equal in width or broader than the dark interspace but not sharply outlined. Abdomen more expanded at segm. 4—5, greatest width at base of 5 up to 3.2 mm. Hab.: Borneo . . . . . **foliacea**

— Male superior appendages in dorsal view more than four times as long as their maximum width, swollen longitudinal ridge sinuate and apex not so broad; outer margin of each in profile only slightly convex and inner (mesal) border of distal shelf not angular. Inferior appendage narrower and parallel-sided, apical branches not outcurved (Fig. 6). Body darker, blackish brown; legs almost black. Lateral thoracic bands bright yellow, narrower than the dark interspace and well defined, the mesepimeral band rather tapered and abbreviated above, not quite reaching dorsal margin. Abdominal segments less expanded, greatest width across 5 about 2.5 mm. Hab.: Sumatra and ? Mentawei Is. . . . . **uropetala**

12. Superior appendages enormously expanded, only two times as long as their maximum width and lacking prominent inferior basal tubercle; apex broadly rounded; inferior appendage elongate-triangular, about four-fifths length of superior pair, apex slightly notched (Fig. 8). Body blackish brown with dark green markings; face mainly dark brown, frons dorsally with pair of widely distant transverse streaks behind anterior crest but no definite T-spot present. Legs black. Wings relatively narrow; anal angle of hind wing acute-angulate and slightly produced inward; inner border beyond triangle gently concave (Fig. 8); pterostigma black; membranula narrow and very small, grey. Abdomen long and slender, middorsal carina of segm. 8—9 replaced by narrow zone of minute warts; basal segments moderately inflated, width across auricles 5.0 mm, segm. 3 rather constricted (1.2 mm), then gradually expanded but intermediate segments almost parallel-sided, 8—9 again slightly widened (2.8 mm); 10 more than one-half length of 9, protuberant and sharply longitudinally carinate ventrally, outline in dorsal aspect subquadrangular, upper surface strongly arched and covered with numerous rasp-like denticles (Fig. 8). Dark green abdominal spots small, except on 2 which has a series of coalescent AD, MD and AML spots as well

as isolated PL and PD; 3—6 with small transverse PD only; 7—10 and appendages black. Female unknown. Hab.: Hainan I . . . . . **petalura**

— Superior appendages three or more times as long as their maximum width. Size generally smaller 13

13. Superior appendages in dorsal view at first slightly outbent but soon curving gently inward with the tips meeting, each with proximal third almost parallel-sided, then more or less flattened and insensibly expanded towards apex, which is truncated or bluntly rounded; in profile with prominent basal inferior tooth, the interior subapical edge curled ventrad and angularly projecting; whole inner margin with long hair fringe, the inner shelf and midrib moreover densely clothed with erect hairs which become increasingly longer towards apex (Fig. 10). Distance between apex of anal triangle and anal angle of hind wing (free inner margin) longer than one-half length of distal side of anal triangle (6.6 : 10). Abdomen not markedly spindle-shaped, dorsal surface of 8—9 with longitudinal area of denticles replacing middorsal carina; 10 strongly arched, distal two-thirds finely transversely striate and disk covered with minute denticles. Base and sides of frons obscurely greenish-brown not forming definite spots. Legs chestnut, the knees, apices of tibiae and tarsal segments obscured. Female, see key on p. 154. Hab.: Borneo; Sumatra . . . . **buehri**

— Superior appendages shaped differently, apical portion of each devoid of long hairs. Legs mainly chestnut. Distance between apex of anal triangle and anal angle of hind wing shorter than one-half length of distal side of anal triangle (at most 4.3 : 10) 14

14. Male superior appendages aslant, forming biconvex lanceolate blades which are directed straight back, the midrib a little outcurved; subbasal inferior tooth small, obtuse and directed ventrad, followed at some distance by two or three denticles pointing inward. Inferior appendage comparatively broad (Fig. 10). Anal angle of hind wing a little produced inward. Dorsal surface of frons dark brown with a pair of widely distant transverse, dorso-lateral green spots. Abdomen not spindle-shaped, terminal segments not expanded; middorsal carina of 9 replaced by an irregular area of minute denticles; this segment almost twice as long as 10, which is about one-fourth broader than long, its surface dull, finely transversely striate, the disk more strongly denticulate (Fig. 10). Female unknown. Hab.: Sumatra . . **sumatrana**

— Superior appendages placed horizontally, inner border of each straight or even a little concave but outer border convex. Anal angle of hind wing acute though not produced. Abdomen slightly but distinctly spindle-shaped, a little constricted between 6 and 9, segm. 9 without any indication of a middorsal carina and also lacking a row of denticles; 10 relatively larger, either squarish or longer than broad 15

15. Greatest width of superior appendage situated about half-way its length; inferior appendage shorter, with its sides slightly concave and apex distinctly divaricate (Fig. 9). Abdominal segment 10 greatly swollen, much longer than broad, its surface smooth and shiny with few very minute denticles upon distal half of tergite. Base of frons brown lacking transverse dorso-lateral green spots. Female, not definitely known. Hab.: Borneo; Malaya (Singapore) . . . . . **amata**

— Greatest width of superior appendage situated beyond half-way its length from base; inferior appendage longer and straighter, with its apex narrowly bifid (Fig. 6). Abdominal segment 10 less inflated, squarish in dorsal view, its surface dull, finely transversely striate, denticles covering central area of tergite stronger and more

numerous. Dorsal surface of frons reddish brown with a pair of widely distant, transverse, dorso-lateral green spots similar to those of *O. sumatrana*. Female closely similar to male, see key on p. 152. Hab.: E. Borneo . . . . . **mutata**

Key to the females of the *O. poeciloptera* group

(The females of *O. amata, petalura, sumatrana, venusta* and *zambo* are still unknown)

1. Fore and hind wings with two rows of cells M_4-*Mspl*. Upper surface of frons without transverse dorso-lateral green spots 2
— Only a single row of cells M_4-*Mspl* on all wings. Discoidal field of hind wing with 2 cells between apex of triangle and middle fork 6
2. Abdomen strongly spindle-shaped, 5 at least three times as broad as 3 at its constriction; ventral portions of tergites 4—6 broad, width across 5 about one-seventh of its length, the ventral carinae of these tergites undulated. Neuration open; only 2 cells between apex of triangle and middle fork in discoidal field of hind wing; anal area of hind wing with only 3 cells bordering cubital space proximal to anal loop and only 2 cells between anal loop and posterior border of wing. Discoidal triangle of hind wing longer than in *O. modiglianii*: proximal side much less than one-half length of costal side. Wing membrane uniformly tinged with brownish yellow except a hyaline marginal area at apex of hind wing. Apical abdominal tergites feebly and minutely denticulate. Abdomen 40.5—42.0, hind wing 38.0—41.4, pt. fore wing 2.7—3.1 mm. Hab.: Borneo . . . . . **platyura**
— Abdomen not spindle-shaped, segments approximately of equal width throughout; ventral portions of tergites 4—6 narrower, width across 5 one-tenth or less of its length, the ventral carinae not markedly undulated 3
3. Wing colour and neuration much as described for *O. platyura* but anal area of hind wing still broader and more densely veined; anal area with 4 cells bordering cubital space proximal to anal loop and with 2—3 cells between loop and posterior border of wing; 4 sectors in area posterior to Cu_2, all of them longer and straighter than in *O. platyura*. Discoidal triangle of hind wing broader: proximal side about half as long as costal side. Apical abdominal tergites as described for *O. platyura*. Dentigerous plate as in Fig. 7. Abdomen 42.7 (approx.), hind wing 42.0, pt. fore wing 2.9 mm. Only a single spirit specimen known. Hab.: Nias I . . **modiglianii**
— Combined characters not as above 4
4. Wings broad and densely reticulated: 3 cell-rows between apex of triangle and middle fork in discoidal field of hind wing, anal area of hind wing with 5—6 cells bordering cubital space proximal to anal loop. Area posterior to Cu_2 in hind wing broad, with maximum of 6 cells between Cu_2 and hind margin; course of sectors in this area straighter, meeting the wing margin almost at a right angle. Discoidal triangle of hind wing relatively long, proximal side about half as long as costal side. Membrane clear hyaline but bases deeply stained with golden yellow, in fore wing to a little beyond apex of triangle and in subcostal space to the nodus, in hind wing as far out as the nodus and abruptly leaving off right across wing. Dorsum of apical abdominal segments feebly denticulate. Cerci broken off; dentigerous plate as in Fig. 7. Abdomen 44.0, hind wing 41.5, pt. fore wing 2.3 mm. Hab.: E. Borneo . . . . . **spec. indet. B**

— Wings much narrower and less densely reticulated: only 2 cells between apex of triangle and middle fork in discoidal field of hind wing and anal area of hind wing with 3—4 cells only bordering cubital space proximal to anal loop; area posterior to Cu_2 in hind wing narrower, branches of Cu_2 aslant, taking a more longitudinal course towards wing margin and meeting the border at a more acute angle. Wing membrane more or less tinged or banded with brown but not contrastingly saffronated 5

5. Wings relatively long and narrow, anal angle of hind wing not protuberant, curvature of posterior margin evenly convex; anal area of hind wing with 4 cells bordering cubital space proximal to anal loop, the latter exceptionally long, 5- instead of normally 3-celled; discoidal triangle of hind wing elongate, proximal side much less than one-half length of costal side. Wings with short, diffuse, yellowish brown basal rays, dirty yellow disk, ill-defined dark brown apical patches, and subhyaline apices (Pl. 12). Dorsum of abdominal tergites 9 and 10 as well as a narrow zone on either side of middorsal carina of preceding segments, strongly denticulate. Cerci broken off; dentigerous plate as in Fig. 7. Larger species, abdomen 43.4, hind wing 44.3, pt. fore wing 2.8 mm. Male unknown. Hab.: Luzon, Philippine Islands . . . . . **poeciloptera**

— Wings broader, anal angle of hind wing more pronounced and more broadly rounded; anal area of hind wing with only 3 cells bordering cubital space proximal to anal loop, the latter short, 3-celled; discoidal triangle of hind wing shorter, proximal side about one-half length of costal side. Wings yellowish brown all over the membrane. Dorsum of abdominal tergites almost smooth, covered with few small denticles. Cerci broken off. Smaller species, abdomen 39.5—40.5, hind wing 37.3—38.0, pt. fore wing 2.2—2.6 mm. Male unknown. Hab.: E. Borneo . **spec. indet. A**

6. Upper surface of frons with a pair of transverse, widely separated, obscurely green dorso-lateral spots. Ground colour of body dark brown; abdomen moderately spindle-shaped. Wing membrane either subhyaline or faintly spotted with yellow in anterior part between nodus and pterostigma; or else, stained with deep yellow-brown all over (most intense in area proximal to pterostigma), save for the tips which remain uncoloured. Malaysian species 7

— Frons coloured otherwise 8

7. Small species with rather broad wings and short pterostigma: abdomen 35.0—37.0, hind wing 34.0—35.4, pt. fore wing 2.2—2.3 mm. Wing membrane entirely hyaline with faint yellowish tinge on disk only; anal area of hind wing with 3 cells bordering cubital space proximal to anal loop; only 2 cells between anal loop and posterior border and with a maximum of 4 cells between Cu_2 and the margin. Cerci broken off; dentigerous plate as in Fig. 7. Hab.: E. Borneo . . . . . **mutata**

— Size larger, wings relatively long with much longer pterostigma: abdomen (allotype) 45.0, hind wing 42.0, pt. fore wing 3.1 mm. Wing membrane at least with diffuse cloudy yellow area in anterior part between nodus and pterostigma (allotype), this colour frequently much darker and occupying the entire surface, except the tips beyond pterostigma which remain hyaline; anal area of hind wing with 4 cells bordering cubital space proximal to anal loop. Cerci broken off; dentigerous plate as in Fig. 7. Hab.: Sumatra; ? Mentawei Is. . . . . **uropetala**

8. Upper surface of frons uniformly brown, lacking dorso-lateral green spots. Malaysian species 9

— Species from Celebes and Buton. Upper surface of frons with thick dark brown basal stripe of even width extending all along eye-margin; medially this stripe is connected by a very short stalk with an even heavier, crescent-shaped black anterior patch covering the frontal crest and occupying nearly the whole of the anterior surface as well; these dark areas on top of frons enclose a pair of bright yellow-green transverse bars, one at each side of the tiny median stalk. Wing membrane hyaline but base of fore wings palely and diffusely saffronated in *c-sc* as far as the nodus and posteriorly again to proximal side of triangle; basal half of hind wings golden brown as far as the nodus and abruptly terminating straight across wing. Anal area of hind wing broad, with 4 cells bordering cubital space proximal to 4-celled anal loop, and with 2 cells between apex of loop and posterior border; a maximum of 6 cells between Cu_2 and hind margin; sectors in this area fairly distinct, entering the wing margin at an acute angle. Femora brown tipped with black. Abdomen apparently not spindle-shaped. Cerci extremely long and slenderly stalked, longer than segm. 8—10, apex abruptly spatulate (Fig. 11). One rather immature specimen from Celebes . . . . . **venatrix**

9. Abdomen of extraordinary shape: basal segments inflated, 3 strongly constricted 4—6 greatly expanded and depressed (attaining more than four times the width of 3 at the constriction), segments then again rapidly narrowed and compressed till end of abdomen. Anal area of hind wing with 3 cells bordering cubital space proximal to anal loop, the latter 3-celled; Cu_1 and Cu_2 more strongly convex than usual; area posterior to Cu_2 broad, with 4—5 almost straight sectors and up to 5 cells between Cu_2 and hind border at level of greatest expansion. Membrane transparent amber brown, hyaline at apex and behind triangles. Cerci broken off. Abdomen 42, hind wing 44 mm. Male unknown. Hab.: S.E. Borneo . . . . . **elacatura**

— Abdomen not unusually spindle-shaped; remaining characters not as above . . 10

10. Wings relatively broad with open venation, only 3 cells bordering cubital space in anal area of hind wing proximal to anal loop. Cu_1 and Cu_2 not strongly convex, area posterior to Cu_2 with 4—5 cells between Cu_2 and hind margin. Membrane either subhyaline or with bases saffronated in *c-sc* as far as the nodus and posteriorly again to slightly beyond apex of triangle in both pairs of wings, the limits of this colouring very indistinct. Cerci shorter than segm. 8—10 but longer than 9 + 10, as in Fig. 4; dentigerous plate, Fig. 7. Abdomen 41.0—42.3 + 7.4, hind wing 42.0—43.2, pt. fore wing 3.1—3.4 mm. Hab.: Borneo . . . . . **foliacea**

— Hind wing with 4 cells bordering cubital space in anal area proximal to anal loop 11

11. Wings narrow with open venation; only 2 cells between anal loop and posterior border of hind wing; area posterior to Cu_2 narrow, with a maximum of 4 cells between Cu_2 and hind margin; sectors weak, their course more or less fractured . 12

— Wings much broader basally and more closely reticulated; 3—4 cells between anal loop and posterior border of hind wing; area posterior to Cu_2 broad with a maximum of 5—6 cells between Cu_2 and hind margin and with 3 strong and straight sectors. Membrane hyaline but bases deeply stained with orange yellow, this colour extending to apex of discoidal triangle in fore wing, as far as the nodus and apex of Cu_2 abruptly leaving off right across wing, in hinder pair. Cerci broken off. Hind wing 38.1, pt. fore wing 2.2 mm. Male unknown. Immature specimen from N. Borneo . . . . . **spec. indet. D**

12. Extent of coloured area on wings exactly as described for the previous species from

N. Borneo but basal half of wings less broad and wings much less closely veined. Abdomen (flattened) apparently not spindle-shaped. Cerci longer than segm. 8—10, with very long linear stalk, apical portion abruptly expanded, as in Fig. 4; dentigerous plate with about 14 teeth in a row. Abdomen 43.0 + 8.5, hind wing 39.0, pt. fore wing 3.0 mm. Immature specimen from NE. Sumatra . . . **buehri** (supposition)

— Basal portion of hind wing less broad than in either *O. foliacea* and *buehri*; whole surface of membrane, except at apex narrowly, amber yellow; neuration still more open, sectors in area posterior to Cu_2 of hind wing indistinct, their course fractured. Abdomen markedly spindle-shaped. Cerci shorter than 8—10 but longer than 9 + 10, as in Fig. 7; dentigerous plate, Fig. 7. Abdomen 41.0 + 6.4, hind wing 40.0, pt. fore wing 2.7 mm. Male unknown. Hab.: W. Borneo (Pontianak) . . . . . **spec. indet. C**

Oligoaeschna martini (Laidlaw)

Fig. 1

Jagoria martini Laidlaw, 1921: 76—77 (♀ Darjeeling Distr., Tiger hill, 8300 ft., 26.VI.1918, no. 1407—2, S. W. Kemp; holotype Zool. Survey India, Calcutta, lost?). — Fraser, 1922: 611—612 (descr., copied from Laidlaw; type not seen); 1936: 59—60, figs. (partim: composite descr.).
Aeshna nigripes Navas, 1932: 12—14, fig. 23—24 (♂ struct., Kurseong, Hymalaya; holotype coll. Navas, Zaragoza, lost?).

This species and its nearest allies have a complicated history and the specific synonymy involved is equally intricate.

The types of both *Jagoria martini* and *Aeshna nigripes* being unavailable and probably lost, no clear-cut characters of these somewhat puzzling insects can be given. At the same time there can be no doubt that they are the sexes of a single species, as suggested already by Fraser (1936). The name *nigripes* can not be used, *Aeshna nigripes* Navas, 1932, being a secondary homonym of *Aeshna nigripes* Kirby, 1890 (= *Gomphus nigripes* Selys). Fraser's description and crude sketches of the male appendages are copied from Navas's account of *A. nigripes* and his characterization of the female is based on Laidlaw's diagnosis. It is obvious that Fraser confounded the true *martini* with another species from Assam. The only specimen he had examined himself is possibly the same species — though not the same individual — as the one described hereafter as *O. decorata* sp. n. For further details, see under the next species.

As to *O. martini*, I can do no better than give a verbatim account of the original descriptions, the latin diagnosis of *Aeshna nigripes* published by Navas being a literal translation.[1])

Original description of *J. martini*:

"Length of hinder-wing 40 mm, of abdomen 40 mm.

"Venation. That characteristic of the genus. Nodal indicator $\frac{8—17.16—7}{8 \quad 9.11 \quad 10}$. Triangles of fore-wings of three cells, of hinder-wings four celled. Supra-triangles free. Space between M_4 and *Mspl* of two rows of cells on all wings. Pterostigma dark brown, 2 mm long, braced. Extreme base of wings saffron tinged, the colour not reaching Ax_1.

[1]) I am much indebted to my colleague Dr. C. O. van Regteren Altena who kindly supplied this.

"Head: lower lip, and all the anterior surface orange brown. Dorsal surface of frons very dark brown, black against the eyes: enclosing a yellow mark on either side in front of each eye, so that the dark colour forms a T-shaped median mark. Vertex and occiput black, the latter minute, with a tuft of black hairs. Prothorax: dark brown. Synthorax: dorsal surface very dark brown, with a pair of oblong oval bands of a blue green colour, running upwards and inwards almost to the upper end of the mid-dorsal carina, but not reaching it; a pair of small lines of the same colour start from near the upper end of the first pair and run transversely towards, but not so far as the humeral suture; meso- and meta-notum green. Laterally the synthorax is very dark brown with a large, vivid green bar on the meso-epimerite and a second bar of the same colour nearly covering the whole of the metepimerite. Undersurfaces orange brown. Abdomen: constricted sharply at the third segment, widened again from the fourth to the sixth, the remaining four being narrow; colouring, black above, the sternites orange brown. Segment 1 has a large, green, lateral mark, similar to those of the sides of the synthorax, but slightly more yellow in tone; 2 has a lateral yellow band. Dorsally segments 2—6 have each a pair of apical green spots, semilunar in shape, and very small on 6. In addition 2—4 have each a pair of small transverse marks of a green colour at about the centre of each. Further, 2 has a minute basal triangle of yellowish green. The legs are black; the coxae, trochanters and bases of the femora brown.

"The dentigerous plate of the tenth segment is almost squarely truncate posteriorly, and carries apically a number of small irregularly placed teeth, about fifteen, on its ventral side. The anal appendages are small, about 2 mm long, and are carried in the specimen before me directed vertically upwards.

"The discovery of a species of this genus in the Himalaya extends its range greatly. Hitherto I can find records for Malaya and Japan only, nowhere within 1,500 miles of Darjeeling.

"*Jagoria martini* seems to come nearest to *J. venatrix,* Förster, from Buton in the Celebes group. The female of the latter species is unknown."

Male. — "Head with labium, labrum and the entire face, golden yellow; upper part of frons green, the medially angular anterior carina [frontal crest] and a posterior band between the ocelli [i.e. at base of frons] black; these two [transverse] bands connected medially by a longitudinal black band, forming a I shaped marking; hairs black; compound eyes dark brown; suture between the eyes mediocre; occiput black; occipital triangle very small; occipital hairs black; antennae black. Thorax black: Lobe of prothorax broadly rounded, depressed. Two green [ante] humeral bands, above shortly interrupted, rather ¡-shaped and angular. Sides with two oblique green bands, the anterior one, nearest the shoulders, regular, slightly narrowed towards upper end, the posterior one irregular, widest inferiorly. Green spots on dorsum and green points at the wing bases.

"Abdomen inflated basally, most conspicuously so in vertical direction, at the third segment strongly constricted, then widening at segments 4—6, towards the last segment but slightly narrowed; superior cerci (fig. 23) long, narrow in basal half, narrowly oval in distal half; inferior two-thirds length of superiors, apex bilobate. General colour inclusive of the cerci black, auricles golden yellow; on most tergites two subtriangular apical spots, blue in life?, ..."other broad elliptical [spots?] at the connexivum light-coloured." Legs wholly black. Wing membrane hyaline, slightly suffused with brown;

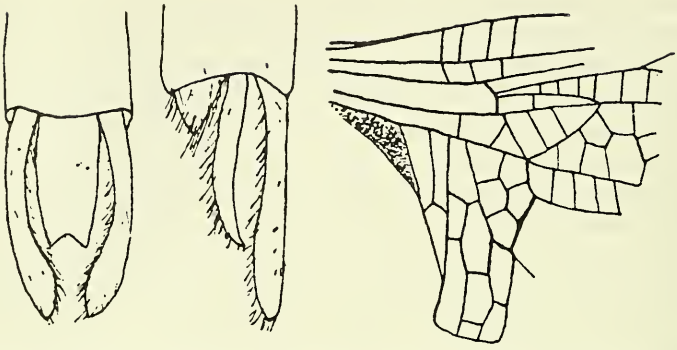

Fig. 1. *Oligoaeschna martini* (Laidlaw), ♂ holotype *Aeshna nigripes* Navas. Anal appendages and base of hind wing (After Navas, 1932)

bases slightly tinged with yellow, more distinctly so between procubitus and cubitus; membranula brown, with an external pale line bordering the veins (fig. 24); reticulation wholly black; stigma short, longer than two underlying cells, brace-vein oblique. Bridge space traversed by 3 cross-veins. Supplementary sector slightly curved in the middle, space between it and sector [i.e. *Rs-Rspl*] with two cells, between *M* and supplementary sector [i.e. M_4-*Mspl*] two divided cells in the middle.

"Fore wing with 16—19 *Ax*, 9 *Px*; about one row of cells *Rs-Rspl*, one cell divided in the middle (in right wing); between Cu_1 and Cu_2 one cell-row. Hind wing with 12 *Ax*, 8—10 *Px*; anal triangle with 3 cells; anal loop small, 5-celled, 3 in inner row, 2 in outer row (Fig. 24).

"Long. corp. ♂ 53 mm
„ al. ant. 36,3 „
„ al. post. 35,5 „
„ al. dom. 38,3 „

"Patria. Kurseong (Hymalaya), 1929. P. Lebas leg., P. Sala ded."

Distribution. — Sikkim.

Oligoaeschna khasiana spec. nov.
Fig. 2—3

Material. — Assam: ♂ (ad., holotype, BM), Assam, Khasia Hills (MacLachlan's writing, ex coll. R. MacLachlan).

Labium greenish yellow, labrum orange-chrome; mandible-bases, whole clypeus and a transverse band in front of frons, green; wrinkled anterior part of frons (i.e. transverse portion of T-spot) black; this area twice as broad as the short T-stem, which is itself somewhat constricted at middle and attached to a black basal stripe extending down along eye-margin. Vertex greenish anteriorly, for the rest brown; occipital triangle and rear of the head black, the former concave and sharply ridged posteriorly, its surface clothed with long, erect, bristle-like black hairs.

Synthorax warm russet, all pale markings sharply defined, bright apple-green, as are also the notal sclerites and axillaries of wings. Lower two-thirds of mesinfraepisternite as well as a much smaller triangular area occupying the metinfraepisternite ventrally, green.

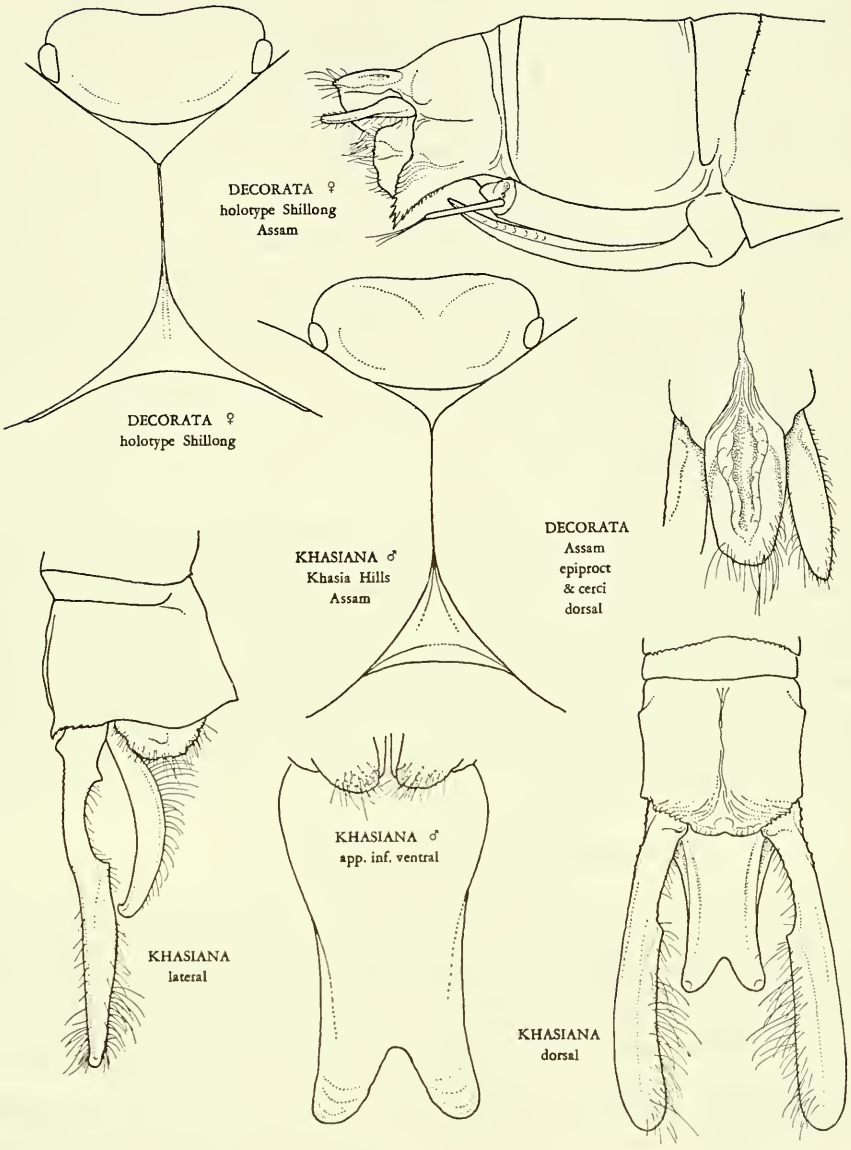

Fig. 2. *Oligoaeschna decorata* spec. nov. ♀ and *O. khasiana* spec. nov. ♂, vertex and interocular region, dorsal view, and other structures

Coxae, trochanters and basal half of femora externally, reddish brown, otherwise the legs are black.

Wings evenly tinged with greyish yellow all over. Neuration open, much as in *O. pryeri*, but pterostigma of small size, considerably shorter than in either *pryeri* or *pyanan* and also shorter than in *decorata*. Nodal index $\frac{7.15.16.\ 9}{9.10.11.10}$; cross-veins in $t\ \frac{2.1}{1.1}$, in $ht\ \frac{1.0}{0.0}$;

anal loop of great size, 5-celled. Anal angle obtuse (Fig. 3). Area posterior to Cu_2 of hind wing with all sectors rather fractured and but slightly oblique, three cells only between Cu_2 and hind border and two cells between apex of loop and wing margin.

Abdomen shaped as described in the key. Although segment 3 is less constricted than in *O. pryeri*, the abdomen from 4 onwards is shaped similarly in the two species, the proportionate lengths of the segments being also practically alike. Middorsal carina of 3—7 denticulate; 9 about one-sixth longer than its width at apex but only one-fifth longer than 10. Green markings small, though well defined, the paired PD on segm. 2—6 (7) closely approximated, those on 2—4 a little longer than their greatest width at apex; sides of 2 and 3 also marked with green, the lateral spot at 1 more or less S-shaped, AML and PL subequal in size and completely isolated. Auricles bright green, in the form of small oval lobes which are armed posteriorly with a double row of about 34—38 irregularly arranged black denticles.

Measurements: abd. + app. 40.0, hind wing 36.3, pt. fore wing 2.0 mm.

Female unknown.

Distribution. — Assam.

It is impossible to identify this specimen with the male from Kurseong, described by Navas as "*Aeshna nigripes*", a species almost certainly conspecific with *O. martini* (Laidlaw), also from the Darjeeling district. A comparison of Navas's crude sketches of the anal appendages of *nigripes* (Fig. 1) with those here given for *O. khasiana* (Fig. 2), clearly shows the differences. Attention may be drawn also to the very different shape of the anal angle of the hind wing in these two insects: the prolongation of the inner border of the anal triangle in *nigripes* is longer and curved inward, the tornal angle itself being prominent (Fig. 1); in *O. khasiana*, on the other hand, the anal angle is unusually short and completely rounded (Fig. 3).

Oligoaeschna decorata spec. nov.

Pl. 12 and Fig. 2

Material. — Assam: ♀ (subadult, holotype, BM), Assam, Shillong, 5000 ft., 5 May 1924, Crinoline Falls, Fletcher coll., ex coll. T. B. Fletcher, in coll. F. C. Fraser.

Female. — Wing venation open but anal loop of hind wing containing 5 or 6 cells and shaped similarly to that of *O. khasiana* sp. nov. Nodal index $\frac{7.15.15.8}{9.10.11.9}$; cross-veins in *t* $\frac{2.2}{2.2}$; *ht* $\frac{0.0}{0.0}$. Anal area of hind wing with 4 cells bordering cubital space proximal to anal loop; only 2 cells between anal loop and posterior border; sectors in area posterior to Cu_2 slightly fractured, their course almost straight towards wing margin.

Structure of terminal segments and cerci as in Fig. 2.

Measurements: abdomen 42.0 + 1.5, hind wing 37.5, pt. fore wing 2.3 mm.

Male unknown.

Distribution. — Assam.

The more important characters of this extraordinary species, photographed in Pl. 12, are given in the key. Features shared alike with *O. khasiana* and allies are the wide and

similarly coloured front, as well as the shortness of the median eye-line (Fig. 2), but here the resemblance ends. The shape and extent of the pale markings on the thorax and abdomen of *decorata* are quite unlike those of *khasiana* and other members of the same group and decidedly characteristic. What causes the abdominal pattern to deviate from the normal is the existence of additional middorsal spots on segm. 2—5, which are fused together with MD and PD, thus rendering the species a colour design found nowhere else in the genus.

The type of this species is unique. It was found by me in a box with an assortment of unidentified mounted Odonata, left behind by the late F. C. Fraser and bequeathed to the British Museum (Nat. Hist.). It disagrees with Fraser's description of *Jagoria martini*, discussed in the previous pages. Fraser (1936) claims to possess a female of *martini* "from Shillong, Assam, taken in June". This individual, which he failed to describe, could not be traced in Fraser's private collection; it has probably been lost. A second female, also from Shillong, is the one here described; its locality label gives the date of capture as 5 May 1924, thus differing from that of the first. It may well be, however, that Fraser knew about the existence of another female, because his drawing of the sexual organs (1936 : fig. 15a) does not fit Laidlaw's description of the type of *J. martini* but corresponds very nearly with the sketches presently given for *decorata*. It is, therefore, very likely that Fraser left unnoticed all further particulars of this specimen and after having figured it forgot all about it. While first examining this dragonfly, a further complication arose when I noticed it to be an artefact, as it possessed a pair of long cerci which had been skilfully attached to the apex of its abdomen. After having relaxed the body and the appendages removed, the specimen turned out to be brachycercous, like other members of the species-group to which it belongs (Fig. 2). The detached cerci may have belonged to one of the females of the supposed *O. uropetala* m., from the Mentawei Islands, which were left unidentified in the same box.

Oligoaeschna pryeri (Martin)

Jagoria pryeri Martin, 1909: 134—135, pl. II fig. 8 (♂ insect, col.), fig. 131 (♂ wing-phot.), 132 (♂ app., Japan); 1911: 18 (id.). — Laidlaw, 1923: 9 (descr. note). — Oguma, 1926: 83 (♀ descr.; Hokkaido, Honshu, Kiushu). — Hirayama, 1929: 17, fig. 27 (♂ insect, phot.).

Oligoaeschna pryeri: Asahina, 1956: 93 (♂ Yakashima I., N. Ryukyus)[1]); 1957: 50—51 (notes); 1958: 10—12, phot. & figs. (larval structures). — Esaki & Asahina, 1957: 82—85, fig. 1—2 (fossil wing record). — Ishida, 1958: 18—19, phot. (larval exuviae & habitat). — Taketo, 1958: 12—17, phot. (ecology); 1959a: 2, phot. (larva); 1959b: 31 (variation in wing venation).

Material. — Japan: ♂, 2 ♀, Japan, Honshu, Mitsukoji, Kanazawa, 27 and 31.V.1959, A. Taketo (ex CSA, ML). ♂, Japan, Honshu, Mobara (75 km SE from Tokyo), Chiba, 21.V.1967, K. Miyakawa (ML).

The most striking features of this species and the next are the curiously inflated basal abdominal segments, almost alike in the two sexes, and the contrastingly variegated body pattern.

Male. — Labium bright chrome, distal portion of lateral lobes obscured; in one male the labrum is wholly black, in the other it bears a pair of small orange basal spots. Pale areas in front of head ochreous changing to green on either side; spots on upper part of

[1]) Yakushima (or Yakusima) is a small mountainous island situated at a distance of about 60 km south of Kyushu (Kyusyu), South Japan.

frons as well as the bands on dorsum of thorax green, the lateral ones bright greenish yellow; juxtahumeral green ventral spots present though small; metepisternal stripe narrow and irregular though not interrupted. Legs wholly black. Wings almost entirely hyaline, faintly tinged with pale yellow at extreme base only. Pterostigma dark brown, covering 2—3 underlying cells; membranula light grey. Details of venation: *Ax* 14—16 in fore wings, 9—10 in hind wings; *Px* 7—8 in fore wings, 7—9 in hind wings; cross-veins in *t* $\frac{2.2}{2.2}$ and $\frac{2.2}{2.1}$; no cross-veins in *ht* (sic); cells in anal loop 5.5 and 3.3.

Abdomen with the five triangular spots on dorsum of 1—2 green (except AD usually chrome), lateral spots of 1—3 bright chrome; dorsal marks of 3—7 green, lateral spots and ventral patches at base of tergites 4—8 greenish yellow. Vesicle of penis black, deeply and broadly emarginate, the branches rounded, not prominent.

Female. — Similar to male but green spots upon vertex larger and all body markings yellow, except PD on 3—6 of abdomen rather more greenish. Thorax with antehumeral band narrower and the juxtahumeral ventral spot larger than in male.

Wing membrane hyaline; bases saffronated as far out as Ax_2 and end of cubital space, this colour ill-limited outwardly; distal portion of wings, from a little beyond nodus almost as far as the tips, tinged less vividly with brownish yellow. *Ax* 14—17 in fore wings, 9—11 in hind wings; *Px* 7—8 in fore wings, 8—9 in hind wings; 2 cross-veins in *t* of all wings; cross-veins in *ht* $\frac{1.0}{0.0}$ and $\frac{1.0}{1.0}$; cells in anal loop 4.4 and 5.4.

A distinct yellow stripe along lower margin of abdominal tergites 8 and 9. Valves and cerci black, the latter equal in length to 10th segment (1.3 mm, measured over mid-dorsal line), of simple form: straight, parallel, dorsoventrally flattened, lanceolate blades with rounded tips.

Measurements: ♂ abd. + app. 44.5—47.5, hind wing 38.0—39.0, pt. fore wing 3.0 mm; ♀ 42.2—48.0, 38.0—39.5, 3.4—3.7 mm, respectively.

Distribution. — Japan and Ryukyu Islands.

A diurnal species, widely distributed in the Japanese islands and apparently not rare in suitable habitats. Until recently little was known of the life history and habits of *O. pryeri*, but Japanese students have of late contributed much to our knowledge of this remarkable dragonfly. A full description and good photographs of the larval exuviae, with drawings of structural details can be found in a publication by Asahina (1958). According to Taketo (1958) *O. pryeri* breeds in stagnant water and in central Japan has a flight season from May until the last week of July. Although the species is a daytime flier, the same author also witnessed feeding flights towards dusk and remarks that on hot days the insects avoid the open marsh, taking shelter in more shady surroundings away from water. Females were observed ovipositing in a mossy substance growing on wet soil, the exuviae being found in the swamp vegetation nearby. Skins of *O. pryeri* collected by Ishida (1958) at a hillside near Yokkaichi were picked up from bamboo twigs overhanging small bog pools and sphagnum beds supplied with seepage water. Late in November 1958, Taketo (1959b) dredged up a full-grown larva from the surface mud and debris accumulated in a small pool near Kanazawa, a habitat frequented also by *Somatochlora atrovirens* Selys. The above findings suggest that *O. pryeri* is a spring species and univoltine.

Oligoaeschna pyanan Asahina
Fig. 3

Oligoaeschna pyanan Asahina, 1951: 19, fig. 35 (♂ app., Taiwan).
Jagoria pyanan: Asahina, 1962: 9—10, fig. 1 (♀ apex of abdomen, Taiwan).

Material. — Taiwan: ♂ (holotype, CSA), Formosa, Pyanan pass, 1970 m, 17.VIII.1936, S. Asahina; ♀ (allotype, CSA), Central Taiwan, Tui-Kao-Shan, 5.VII. 1961, S. Ueno.

Very near *O. pryeri* (Martin) and evidently closely related with it.

Apart from the characters mentioned in the original description and those given in my key, the following additional features are worth recording. The duplication of the cells M_4-*Mspl* is complete in fore and hind wings of either sex; in the holotype even the space *Rs-Rspl* contains several irregularly divided cells, i.e. $\frac{4.4}{4.3}$ (♂) and $\frac{2.2}{2.3}$ (♀).

Male. — Chrome yellow clypeal band narrower than in *pryeri* and anterior yellow line bordering clypeal suture on frons obliterated in the middle. Vertex wholly black. Dorsal thoracic bands and transverse spots in front of ante-alar triangles both enlarged and practically fused together; no trace of juxtahumeral green spot; metepisternal stripe reduced to an upper triangle and a rudiment of a spot placed halfway down between this and the spiracle.

Wing membrane as in *O. pryeri*; pterostigma a trifle shorter; membranula smoky brown. Nodal index $\frac{6.17.18.\ 7}{9.11.12.11}$; 2 cross-veins in *t*; cross-veins in *ht* $\frac{0.0}{0.1}$; cells in anal loop 5.4.

Abdomen much as in *O. pryeri*, but auricles about half the size of those in that species and also narrower, carrying only 12—14 recurved denticles. Anal appendages as in Fig. 3.

Female. — Resembles the male in almost all respects. Wing membrane as in the female of *O. pryeri*, only the basal saffroning of a deeper tint and a little less extensive; distal patch also more restricted and evident only on the fore wings as a cloudy spot between nodus and pterostigma. Nodal index $\frac{9.17.18.\ 9}{10.11.12.11}$; 2 cross-veins in *t* but none at all in *ht* (sic); anal loop 5-celled in both hind wings.

Abdomen with all pale spots reduced in size, only AD of segm. 2 larger than in *O. pryeri*; traces only of yellow streaks bordering tergites 8 and 9. Cerci a little longer than segm. 10, aslant and slightly downcurved toward apex, forming narrow, somewhat twisted, lanceolate blades with acute tips.

Measurements: ♂ abd. + app. 46.0, hind wing 40.0, pt. fore wing 2.9 mm; ♀ 46.4 + 1.7, 43.3, 3.0 mm, respectively.

Distribution. — Taiwan.

Oligoaeschna poeciloptera (Karsch)
Pl. 12 and Fig. 4 and 7

Jagoria poeciloptera Karsch, 1889: 238—239 (partim: ♀ Luzon only).

Material. — Philippine Is.: ♀ (lectotype, ZMB), 13234 (print), Luzon. *Jagor* (yellow cadre, unknown writing), *Jagoria* n.g. *poeciloptera* - Krsch (F. Karsch's

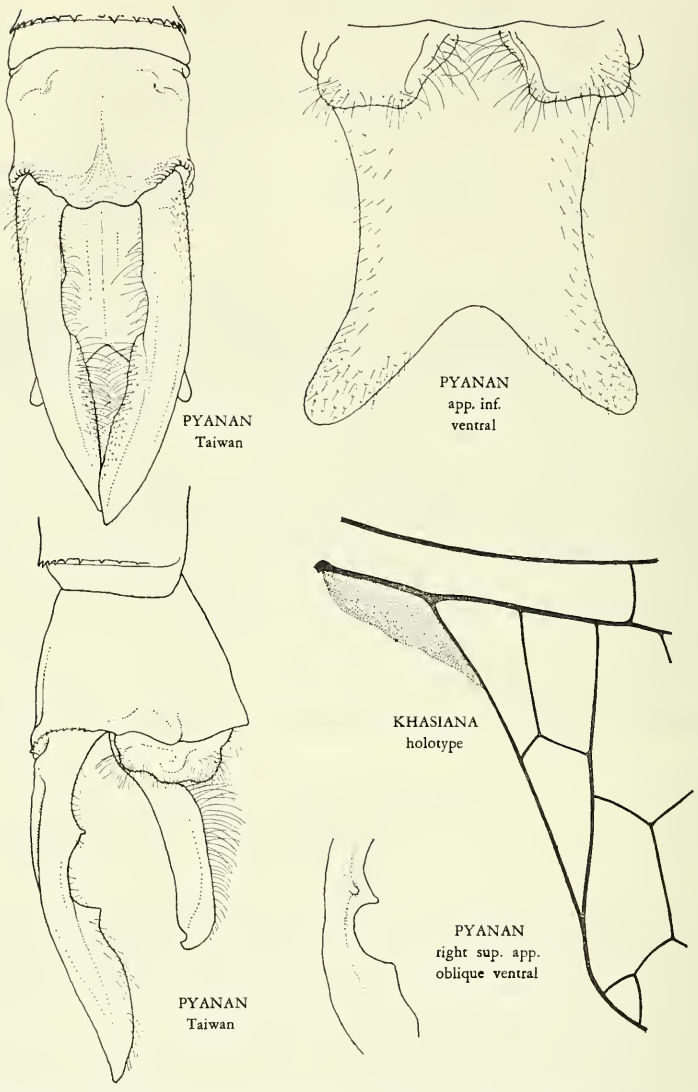

Fig. 3. *Oligoaeschna pyanan* Asahina, anal appendages of ♂ holotype, and *O. khasiana* spec. nov., base of hind wing of ♂ holotype from Assam

writing), Syntypus (print on red), *Jagoria poeciloptera* Karsch 1899, det. K. K. Günther.

The type-species of "*Jagoria*" Karsch.

I have selected Karsch's female, an aged individual in good state of preservation, as the lectotype of *O. poeciloptera.* The male from Singapore, wrongly attributed to it by Karsch, is an immature specimen of *O. amata* (Martin), see p. 176.

Chiefly remarkable for the venation and the colour of its wings (Pl. 12).

Mouth-parts, face and frons unicoloured brown, frons not obscured anteriorly but dorsal surface with darker brown basal stripe which is triangularly produced forward,

expanding a little over the frontal crest without forming a definite T-spot; crest subacute, the surface in front of it only superficially wrinkled. Median eye-line long (Fig. 4).

Body brown, pale markings discoloured and faded but thorax and abdomen marked with the characteristic bands and spots described for allied members of the group: four isolated dorsal thoracic spots, broad lateral yellow bands, the distance separating the latter not wider than the metepimeral band. Legs black but all femora reddish brown turning black apically.

Neuration as shown in the photograph. Anal loop longer than in all other species and 5-celled. Posterior sectors of Cu_2 in hind wing rather longer than in *O. zambo*, following a lengthwise course and entering the wing margin farther away from base. Whole membrane faintly tinged with amber, with diffuse rays of a rather darker tint at extreme bases

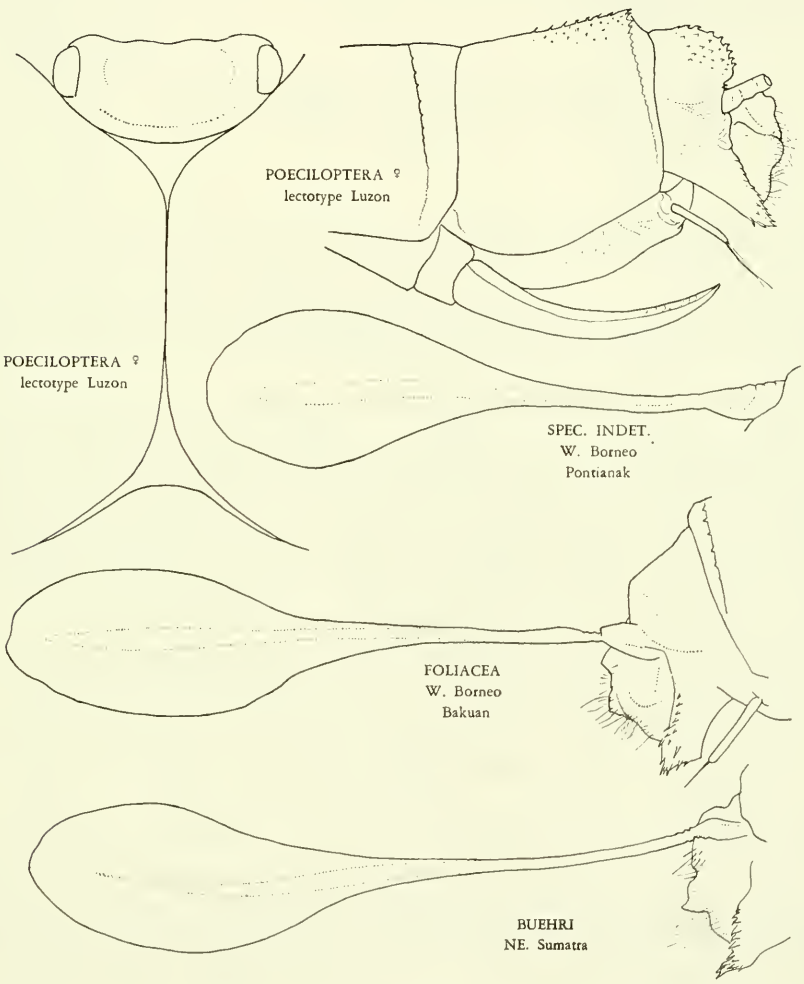

Fig. 4. *Oligoaeschna poeciloptera* (Karsch), ♀ lectotype from Luzon, vertex and interocular region, dorsal view, and apex of abdomen, left side view. *Oligoaeschna spec. indet. C*, from W. Borneo, ♀ cercus, *O. foliacea* spec. nov., ♀ from W. Borneo, and *O. buehri* (Foerster), ♀ from NE. Sumatra, apex of abdomen, showing dentigerous plate and cerci

(not shown in the photograph), this colour deepening to form obliquely recurved brown bands between nodus and pterostigma, the apices beyond these spots hyaline.

Shape and markings of abdominal segments as described in the key. Middorsal carina well developed on all segments, even on distal portion of 2 and basal half of 10, 9 and 10 distinctly denticulate on either side of it. Cerci broken off; dentigerous plate, Fig. 7.

For measurements, see the key on p. 152.

Male unknown.

Distribution. — Luzon, Philippine Islands.

Needham & Gyger (1937) claim to have a second female, from Davao, Mindanao. The wings are described as being "stained with brown deeply at the base, especially before the arculus, the color fading before the level of the nodus in the fore wing and just beyond in the hind wing. Length of hind wing 42." Hence it seems unlikely that this individual belongs here.

Oligoaeschna zambo Needham & Gyger
Fig. 5

Oligoaeschna zambo Needham & Gyger, 1937: 40—41, pl. 2 fig. 33—34 & pl. 3 fig. 48 (♂ app. and wings, Mindanao, P.I.). — Lieftinck, 1940: 378, 384 (Mindanao, sec. Needham & Gyger).

Material. — Philippine Is.: ♂ (semiad., holotype CU), in fragments, with slide preparation of right pair of wings, No. 3556, P.I., Zamboanga [Mindanao], Kabasalan, VII.1932.

This species was described from two males, one of them with incomplete abdomen. The holotype, now before me, is an immature specimen with flattened body and the abdominal segments broken, but the anal appendages are intact and still in good shape (Fig. 5). The recognition of *O. zambo* should not be difficult when consulting the original description in conjunction with the figure and key-characters mentioned on p. 148 of the present paper. Probably most closely related to *O. platyura*, which has a shorter pterostigma and also differs from *zambo* in the shape of the anal angle of the hind wing, which is more incurved and sharply acute, not rectangular.

Our species also resembles *O. amata* in some respects but can be at once distinguished from it by the presence of two rows M_4-*Mspl* in both fore and hind wings.

For a redrawn photograph of the wings, see Needham & Gyger (1937, fig. 48). Nodal index $\frac{9.18.20.\ 9}{11.13.13.11}$; 2 cross-veins in *t*; $\frac{2.2}{1.1}$ in *ht*; only 1 *Bxs* in all wings; anal loop 3-celled.

Measurements: abd. + app. 43.0, hind wing 36.0, pt. fore wing 2.9 mm.

It is hard to say whether or not *O. zambo* is specifically distinct from *poeciloptera*, only a single female of the latter having been described from Luzon. The two species are held apart by Needham & Gyger (loc. cit.), who knew the type of the latter only from the description. From a comparison of the wing venation it would appear that the two are not conspecific.

Distribution. — Mindanao, Philippine Islands.

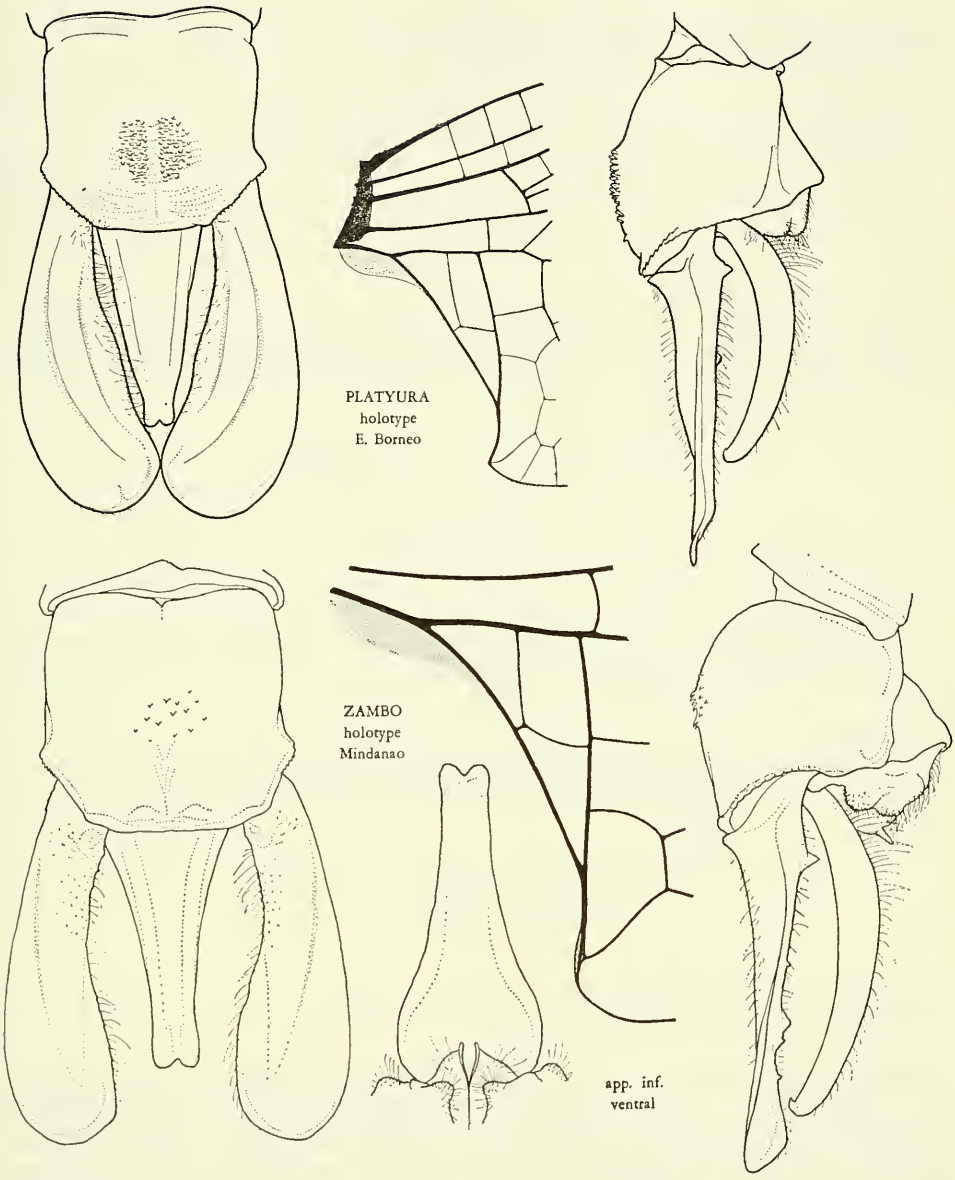

Fig. 5 *Oligoaeschna platyura* Lieftinck (after Lieftinck, 1940) and *O. zambo* Needham & Gyger, ♂ wing bases and appendages, showing differences

Oligoaeschna modiglianii Selys
Pl. 13 and Fig. 7

Oligoaeschna modiglianii Selys, 1889: 471—472, fig. ♂ wings (♂ imperfect, Nias I.). — Lieftinck, 1948: 286 (distrib., partim); 1954: 97, 183 (partim; type not seen).

Material. — Nias I.: ♂ wing photograph, Nias (holotype, MCG); ♀ (semiad., ex alcohol), Eil. Nias, E. E. W. G. Schröder don. 10.1908 (ML).

The type is a male in poor condition, the head being badly crushed while the last four abdominal segments are missing. There is nothing in the original description that would help to settle the status of this species but an examination of the type carried out by me in 1959 at the Genoa Museum surprisingly revealed the presence of two cell-rows M_4-*Mspl* on the hind wings, a feature not mentioned by de Selys. This places *modiglianii* definitely in the vicinity of *O. platyura* Lieft. The neuration (Pl. 13) is, indeed, very much alike in the two species, even the size of the pterostigma being the same. With the discovery of a complete male I expect that the two insects will prove to be nearly related, but this is all that can be said at the moment.

Female. — As far as the neuration is concerned this topotypical example corresponds closely with the male. It also fairly agrees in this respect with the female of *O. platyura*, but the differences (as mentioned in the key) are found in the arrangement of the Cu_2 sectors and the number of cell-rows in the anal field of the hind wings. Also, the discoidal triangles of *modiglianii* are a little shorter than they are in *platyura*. A further distinction is found in the form of the abdomen, which in *modiglianii* shows no sign of being spindle-shaped. The wing membrane is coloured similarly in the two species. Venational details are: nodal index $\frac{10.19.20.\ 9}{12.14.14.13}$; cross-veins in *t* $\frac{2.3}{2.3}$; *ht* $\frac{2.2}{2.1}$; anal loop 3-celled.

Body colouring and markings apparently much as described for *O. platyura*, but all pale spots faded and indistinct. Cerci broken off; dentigerous plate, Fig. 7.

Distribution. — Nias I.

Oligoaeschna platyura Lieftinck
Fig. 5 and 7

Oligoaeschna platyura Lieftinck, 1940: 378—380, 383—384, fig. 16—17 (♂ wing-base & app., Borneo); 1954: 98, 184 (♂ ♀ Borneo).

Material. — Borneo: 2 ♂, ♀ (ad.), ♀ (juv.), E. Borneo, Kutai, Sangkulirang distr., Kariorang (♂), Pelawan Besar (♂ holotype and ♀ juv.), and Batau Besi (♀ allotype), V.1937; ♂ ♀, Kutai, Samarinda, XII.1938 and III.1939; all M. E. Walsh (ML); ♂, S. Kutai, Balikpapan, Mentawir river, 50 m, X.1950, A. M. R. Wegner (ML); ♀, N. Borneo, Sandakan, coll. about 1895—96, A. L. Cook, pres. 1899 by Herbert Druce (OUM).

The male from Balikpapan and the female from Sandakan are additional specimens. The former agrees with the type and two paratypical males, also from East Borneo. The female is in good condition, resembling others of the same sex in possessing a similarly, though even more strongly, spindle-shaped abdomen. As with the previously described females, the cerci are unfortunately lacking so that no description of these can yet be

given; dentigerous plate as in Fig. 7. Further details are given in the keys.

Some venational characters can be summarized as follows.

Male: *Ax* 18—20 in fore wings, 12—15 in hind wings; *Px* 9—11 in fore wings, 9—13 in hind wings; 1—3 cross-veins in *t* of fore wings, 2 in hind wings; 0—3 cross-veins in *ht* of fore wings, 0—2 in hind wings; anal loop 3-celled. Female: *Ax* 16—20 in fore wings, 11—14 in hind wings; *Px* 8—10 in fore wings, 10—12 in hind wings; 2—3 cross-veins in *t* of both fore and hind wings; 1—2 cross-veins in *ht* of both fore and hind wings; anal loop 3-celled.

The dimensions of 4 males are: abd. + app. 46.0—48.2, hind wing 38.0—40.0, pt. fore wing 2.5—2.9 mm; female (see key to species).

Distribution. — North and East Borneo.

N.B. — Two of the 4 adult females (from Batau Besi and Kariorang in the Sangkulirang district), which I had associated with the males in the original description, are not this species. They are left unnamed and treated here as *O. spec. indet. A.*

Oligoaeschna spec. indet. A

Oligoaeschna platyura Lieftinck, 1940: 378, 380 (partim: 2 ♀ from E. Borneo only).

Material. — Borneo: 2 ♀ (adult, cerci wanting), E. Borneo, Sangkulirang distr., Kariorang, 2.I.1937 and Batau Besi, 16.VI.1937, both M. E. Walsh (ML).

Previously referred to *O. platyura* but undoubtedly a distinct species, the male of which remains to be discovered.

These small-sized females superficially resemble those of *O. mutata* but, apart from the important venational differences, can be easily distinguished from that species by the longer not spindle-shaped abdomen, absence of green frontal spots and also by having a longer pterostigma.

The dimensions and other details of these individuals are given in the key.

Distribution. — E. Borneo.

Oligoaeschna spec. indet. B

Material. — Borneo: ♀ (adult, cerci lacking), E. Borneo, Kutai, Tabang, Bengen river, 125 m, 15.IX.1956, A. M. R. Wegner (ML).

A fully matured specimen with the basal portion of the wings deeply stained with orange-yellow. The wings are even more densely reticulated than in the female of *O. modiglianii* and also a little broader. Easily distinguished from *O. platyura*, which has a more open venation, narrower and only faintly coloured wings and a spindle-shaped abdomen. The extent of yellow on the wing membrane recalls the females of *O. buehri* and our *spec. indet. D*; both of these differ, however, in having only a single cell-row M_4-*Mspl.*

Very probably a distinct species.

Distribution. — E. Borneo.

Oligoaeschna venusta spec. nov.
Pl. 13 and Fig. 6

Material. — Borneo: ♂ (ad., holotype, ML), E. Borneo, Kutai, Tabang, Bengen river, 125 m, 9.IX.1956, A. M. R. Wegner.

Labium and mandibles brown, the apical teeth of the latter obscured. Labrum ochraceous-orange, its lateral borders as well as a short streak along middle of anterior margin rather more brown. Clypeus unicoloured yellowish olive. Frons darker, rather more greenish brown, its anterior surface rugosely wrinkled and deep black, except laterally. Vertex, occipital triangle and rear of the head black, as is also the short pubescence covering these parts.

Synthorax dark brown, marked indistinctly with yellow: dorsum with a pair of narrow, oblique antehumeral stripes, incomplete on either end, and with indication of a pair of transverse oval spots of the same colour placed in front of the ante-alar triangles, which are black. Sides with broad meso- and metepimeral yellowish bands, the former widest ventrally, the latter more or less triangular in outline and occupying most of the surface.

Legs mainly black, outer faces of all femora (save the apices) obscurely reddish brown.

Wing membrane faintly tinged with yellow, this colour slightly deepening along anterior border, tips almost hyaline; membranula pure white. Neuration and conspicuous basal markings as described in the key and as shown in the photograph (Pl. 13). Nodal index $\frac{12.22.23.11}{12.15.15.13}$; cross-veins in *t* $\frac{3.2}{2.2}$, in *ht* $\frac{2.3}{2.2}$; anal loop 3-celled.

Shape and texture of abdominal segments partly as described earlier; middorsal carina present on segm. 3—8 and all minutely denticulate; 9 not carinate, its surface finely transversely striate. Auricles subtriangular, carrying 5—6 irregular teeth posteriorly, their colour inclusive of a basal area below them, yellow. Pale markings ill-defined, obscurely brownish yellow, as follows. Segm. 2 with small triangular AD and vestigial paired PD; 3—4 with paired triangular MD (vestigial on 4), and 3—7 with transverse crescent-shaped PD, decreasing rapidly in size posteriorly; 4—8 moreover with rather large, sub-oval AL, which are continued underneath across the lateral carinae as subrectangular patches which occupy approximately the basal two-fifths of the tergites.

Measurements: abd. + app. 49.5, hind wing 44.5, pt. fore wing 3.5 mm.

Female unknown.

Distribution. — E. Borneo.

This fine new species is noteworthy for the intensely dark spots at the wing bases and the two rows of cells between the veins *Rs-Rspl*, both of which are unique features serving to distinguish it from all other *Oligoaeschna* so far known. Further peculiarities of structure are indicated in the key. The anal appendages resemble those of *O. uropetala* spec. nov. rather closely, but the two species are not at all related.

Oligoaeschna elacatura (Needham)

Dolaeschna (gen. nov.) *elacatura* Needham, 1907: 142—144, fig. 3 (phot. of whole insect, ♀ Mindai, SE. Borneo).

Jagoria elacatura: Martin, 1909: 135—136 (notes, sec. Needham; not seen).

Jagoria modiglianii: Ris, 1911: 240—242 (comp. notes, ♀ Borneo; type not seen).

I have not seen the unique type of this species. Its principal characters can all be derived from the original description and illustration, which are very good. — Venation

Ax 17 in fore wing, 12 in hind wing; *Px* 8—9 in fore wing, 9 in hind wing; 2 crossveins each in all *t* and *ht*; *Bxs* 1—2 in fore wing, 2 in hind wing; anal loop 3-celled.

In 1907, when Needham characterized this aeshnid under the new generic name of *Dolaeschna*, it was on account of the curiously spindle-shaped abdomen and the primitive wing venation, which resembled *Gomphaeschna*. Although Martin's monograph (1908) was only just about to appear, it is amazing that Needham could have described this dragonfly as belonging to a new genus, when Karsch and Selys had already proposed *Jagoria* and *Oligoaeschna* so many years earlier. Soon after the publication of Needham's *Dolaeschna elacatura*, the species was recognised by Ris (1911) as a member of *Jagoria* (= *Oligoaeschna*) and placed as a synonym of *O. modiglianii* Selys. Since we have seen that the latter possesses two rows of cells M_4-*Mspl* on all wings, whereas *elacatura* has only one, the neuration at the same time being more open than in members of the *O. modiglianii* group, there is every reason to revive the name and restore the status of *elacatura* Needham. The description and excellent photograph of the whole insect clearly indicate its affinity with *O. foliacea* spec. nov. The differences between the two have been set forth in the key to the females. As long as no males corresponding with the diagnosis of *Dolaeschna elacatura* are available from the same area as the type, I prefer to consider both *elacatura* and *foliacea* as distinct species.

Male unknown.

Distribution. — Southeast Borneo.

Oligoaeschna foliacea spec. nov.
Fig. 4, 6 and 7

Jagoria modigliani Martin, 1909: 130—131, fig. 126 (♂ wing photogr., Borneo), 127 (♂ app., Borneo); 1911: 18, pl. 4 fig. 4 fig. 3 (?♀ insect, col.), 3a-b (♂ app., Borneo). — Fraser, 1936, fig. 14 (♂ wings, copied from Martin).

Jagoria Modiglianii: Krüger, 1899: 288, 327—328 (partim, ♂ Brunei). — Ris, 1911: 240—241 (partim, ♂ W. Borneo only).

Oligoaeschna modiglianii: Lieftinck, 1940: 377—378 (♂♀ W. & NW. Borneo); 1948: 286 (distrib., partim); 1954: 97, 183 (references & distrib., partim).

Material. — Borneo: 3 ♂ 2 ♀ (1 ♂ 1 ♀ semiad., ♀ cerci intact), W. Borneo, Singkawang area, Mt. Poteng, 400 m, 15.IV.1934 (♂ holotype), Mt. Raja, Sungei Bagak, 7.IX.1932 (♂ paratype), Bakuan "at dusk", 20.VI.1932 (♂ paratype), Patengahan-Bakuan road, 20.VII.1931 and 15.IX.1932 (♀ allotype and ♀ paratype), all L. Coomans de Ruiter (ML). ♂ (ad.), labelled Brunei and *Jagoria Modiglianii* Selys, det. L. Krüger (NMS). ♂, Borneo, Brunei, coll. Staudinger acq. 1903, *Jagoria Modigliani* Selys Bornéo (R. Martin's writing, ML). ♂, *Oligoaeschna Modigliani* Selys Bornéo (id.), 95.68 pres. by R. Martin (BM). Previously examined material: ♂ ♀, Borneo, *O. modiglianii* Selys, det. R. MacLachlan, ex coll. MacLachlan (BM). ♀ indet., Pontianak, Borneo (MacLachlan's writing, BM). ♀ indet., position doubtful, labelled Sum (white disk), Sumat. Wallace 68.3 (print), pres. by W. W. Saunders (BM). 5 ♂ 8 ♀, all from Borneo (MP) and 3 ♂ 2 ♀, ditto (IRSN). 5 ♂ (3 defective), NW. Borneo, Sarawak, labelled Matang Rd., Limbang, 23.IV.1910, and Baram, 18.X.1910 (SMK).

This is the species formerly called *O. modiglianii* by all authors including myself. *O. foliacea* was first mistaken for that species by Martin (1909) whose descriptions are accompanied by an excellent wing-photograph of the male (clumsily redrawn by Fraser, 1936) and by Menger's pictures of the anal appendages. Martin also described a complete

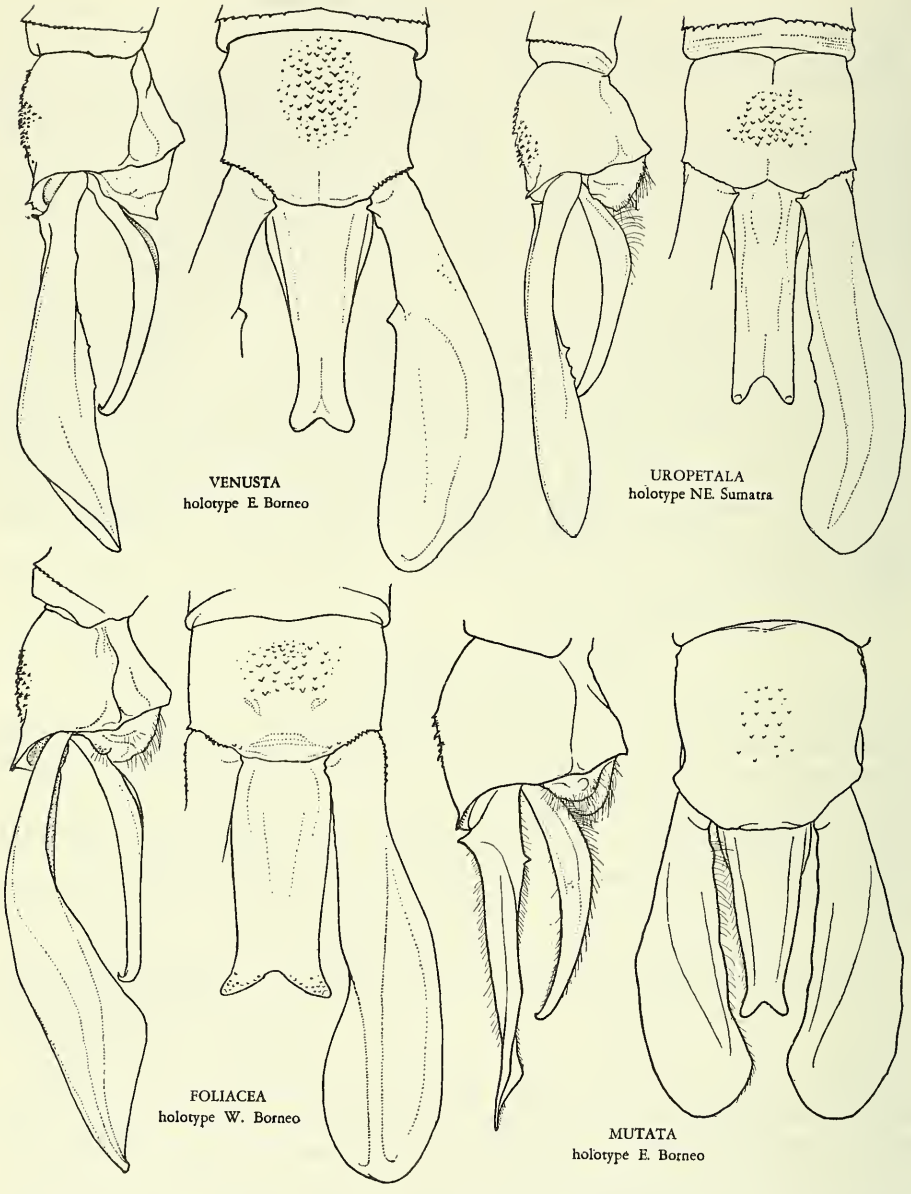

Fig. 6. Male anal appendages of four species of *Oligoaeschna*, right lateral and dorsal view

female, with its cerci intact, but I have found no such specimen in the Paris Museum; the female depicted by him in the Genera Insectorum (1911) may or may not belong to the present species. In 1936 I was enabled to examine the only male of *"modiglianii"* reported by Krüger (1899) from Brunei; this was returned to the Stettin Museum and also turned out to be *foliacea*. The identity of the two females (from NE Sumatra and Brunei) discussed by Krüger in the same publication, must, however, remain unsettled.

Further specimens were dealt with by Ris (1911), who had a male from West Borneo undoubtedly belonging to *foliacea*, but here again the females described by him do not belong and are possibly *O. elacatura* (Needham) or yet another species. Lieftinck (1940—1954) merely gave a summary of the existing literature, commented upon the distribution and put on record new localities taken from freshly accumulated material. These references mainly applied to the present species but also to others, including a near ally recorded by Laidlaw (1926) from the Mentawei Islands. The last-mentioned insect is the one discussed in this paper as *O. uropetala*, a new species from Sumatra.

With a better knowledge of the wing venation of the type of *O. modiglianii* and a topotypical female of that species, we arrive at the conclusion that all specimens previously referred to *modiglianii* are specifically distinct therefrom and should therefore be renamed.

Specific features of *O. foliacea* not mentioned earlier can be summarized briefly as follows.

Male. — Mouth-parts ochraceous-orange, clypeus and anterior surface of frons olivaceous, the transition between postclypeus and frons indicated by a rather more yellowish stripe; rest of frons brown anteriorly, this colour growing darker upwards as far as the transverse crest, which is sharply pronounced, black or almost so. Dorsal and lateral parts of frons unicoloured brown, occasionally with some slight obscuration in the depth of the sulcus. Vertex, occipital triangle and pubescence brown, but rear of the head distinctly lighter, brownish yellow.

Ground colour of thorax and abdomen reddish brown, more rarely somewhat darker. Legs of the same colour, tibiae and apices of femora darker than the rest. Wing membrane slightly tinged yellowish, except the anal triangle and adjoining area of hind wing, which remain hyaline. Pterostigma dark ochreous; membranula light grey. Neuration open. *Ax* 17—19 in fore wings, 11—13 in hind wings; 2 (very rarely 1) cross-veins in *t* of fore wings, 2 in hind wings; 1—2 cross-veins in *ht* of fore wings, 1 in hind wings; anal loop 3-celled. Only 2 cells between apex of anal loop and posterior border.

Measurements: abd. + app. 43.4—50.0, hind wing 38.0—42.5, pt. fore wing 3.0—3.2.

Female. — One of the two specimens still before me is here selected as the allotype of *foliacea*; it agrees so closely with the male that I have no doubt of its correct identification. The same applies to the second female which is, however, slightly immature and has the wing-bases yellowish. I add drawings of the dentigerous plate of the former (Fig. 7) and the cerci of the latter (Fig. 4).

The remaining females listed above were studied by me in various museums and found to agree. Despite this, I believe that in view of the great resemblance between the females of *O. foliacea* and *uropetala*, the occurrence of *foliacea* outside Borneo still requires confirmation.

Distribution. — Borneo; ? Sumatra.

Oligoaeschna uropetala spec. nov.
Fig. 6 and 7

?*Jagoria modigliani*: Laidlaw, 1926: 226 (♂ ♀ Mentawei Is., notes).
Oligoaeschna modiglianii: Lieftinck, 1953: 255 (♂ ♀ NE. Sumatra, record only).

Material. — Sumatra: ♂ (holotype, ML), ♀ (allotype, ML), N.E. Sumatra,

Deli, Laut Tador, 90 m, 10.IV.1949 (♂) and 12.V.1948 (♀), R. Straatman. — Position doubtful: ♀, NW. Sumatra, Atjeh, Seumanjam, 26.X.1953, R. Straatman (ML). 4 ♀ (2 semiad.), Mentawei Is. (off W. Sumatra): Sipora I., no. 164, 9.X.1924; Siberut I., no. 45, 14.IX.1924; Mentawei, 9.IX.1924; and Mentawei, no. 188, 17.X.1924; all H. H. Karny (ex Mus. Buitenzorg via coll. F. F. Laidlaw to coll. J. Cowley and F. C. Fraser (3 ♀ BM, 1 ♀ ML).

Generally darker and more slenderly built than *O. foliacea* m.

Male (adult). — Mouth-parts and face uniform brown, the clypeus and sides of frons anteriorly light brown intermingled with olivaceous. Wrinkled anterior surface of frons including the crest blackish brown, almost black, the crest sharply pronounced medially; upper surface of frons brown but marked on either side just behind the crest with a transverse green streak. Vertex, occipital triangle and antennae blackish brown but rear of the head brown, only little darker than in *foliacea*. Pubescence black.

Synthorax blackish brown, the antehumeral and transverse antealar spots on dorsum well defined, dark olive-green. Lateral bands also conspicuous, pale ochreous, the mesepimeral band decreasing in width upward and not nearly reaching dorsal margin; ventral surface of thorax greyish brown.

Coxae of all and trochanters of fore legs brown, legs otherwise deep black, only basal part of hind femora dark reddish brown externally.

Wing membrane coloured as in *foliacea*, size and colour of pterostigma as in that species; membranula a little narrower, grey in colour. Neuration open, scarcely differing from that of *foliacea*. Nodal index $\frac{9.20.21.\ 9}{11.13.13.12}$; cross-veins in t $\frac{3.3}{2.2}$, in ht $\frac{3.3}{2.2}$; anal loop 3-celled. Anal angle and area posterior to Cu_2 of hind wings as in *foliacea*, the former well pronounced and rectangulate.

Abdomen shaped much as in *foliacea* but all segments a little less expanded. Auricles yellow, triangular in shape, posterior margin of each armed with few (7—9) black denticles which are directed inward, the innermost teeth largest. Pale markings dark green, those on basal segments clearly outlined, similar in size and arrangement to those of *foliacea*, the paired MD on segm. 2 about twice as large as PD, the former triangular, rapidly decreasing in size posteriorly, vestigial already on 6, the latter crescent-shaped, unapparent on 8. Latero-basal blotches (AL) present on segm. 3—9, those on 4—9 continued underneath across the lateral carinae as subrectangular, dirty orangish patches occupying approximately the basal two-fifths of the tergites. Middorsal crest distinct and denticulate on 3—7, replaced by a longitudinal area of smaller and more numerous denticles on 8—10. Anal appendages, superior pair black, the inferior one very dark brown (Fig. 6).

Measurements: abd. + app. 48.0, hind wing 37.0, pt. fore wing 3.0 mm.

Female. — Runs out in my key to near *O. mutata* on account of the presence of pale frontal spots, which distinguishes it from *foliacea*. However, *foliacea* in other respects resembles *uropetala* much more closely than the smaller-sized *mutata*, which also differs in the wing venation.

The adult female from Deli (Sumatra) is undoubtedly conspecific and here taken as the allotype. It is closely similar to the male, differing only in the following respects. Mouth-parts, face and lower half of anterior surface of frons more brightly coloured, ochraceous-orange, on wrinkled area of frons gradually passing to brownish black at the crest; dorsal surface and sides of frons brown, the green dorso-lateral spots distinct though

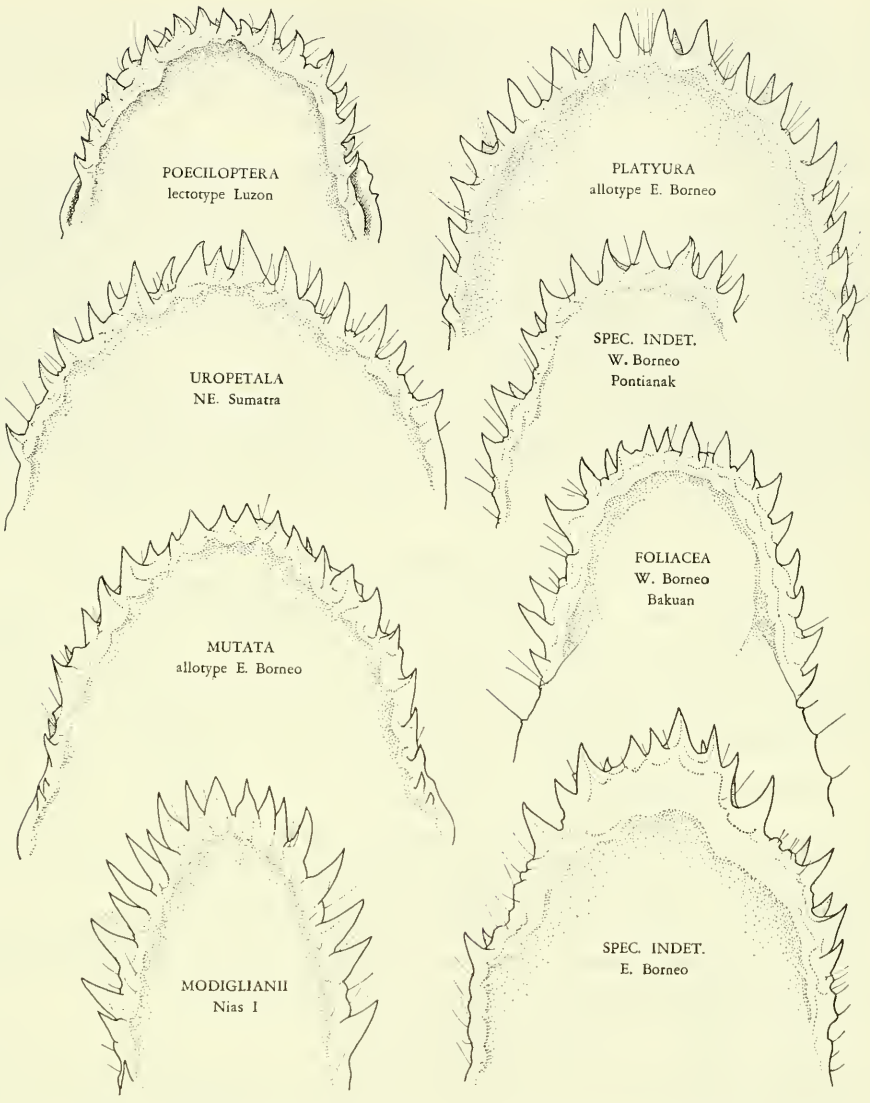

Fig. 7. Posterior (caudal) view of tenth abdominal sternite (dentigerous plate) of ♀ *Oligoaeschna* species, drawn on the same scale. Different breadths are mainly due to compression of plates in immature specimens

less defined than in the male. Dorsal and lateral thoracic markings indistinct by discolouration. Femora scarcely lighter than in male but much darker than in the female of *foliacea*.

Wing membrane faintly suffused with pale yellow, this tinting more evident and rather cloudy between nodus and pterostigma in anterior part of wings. Neuration similar to male. Nodal index $\frac{7.17.16.8}{9.13.13.8}$; cross-veins in $t\ \frac{2.2}{2.2}$, in $ht\ \frac{2.3}{3.2}$; anal loop 4-celled.

Abdomen brownish black turning quite black towards apex, its general shape and all

pale markings almost exactly as in the opposite sex, pale spots greenish ochreous, MD on 3—4 and PD on 3—7 all a trifle larger. Middorsal carina present on 3—9, the one on 10 replaced from end to end by a narrow area of microscopical longitudinal striae. Cerci broken off; dentigerous plate, Fig. 7.

Distribution. — NE. Sumatra.

Although in the key to the females I have mentioned some characters common to all specimens listed under this species, I am not at all sure, by the absence of any males, that the specimens from Atjeh and those taken in the Mentawei Islands are correctly referred to *O. uropetala*. Of the 3 males and 7 females listed by Laidlaw as from the islands of Siberut and Sipora, none of the males and only 4 females could be recovered in the Laidlaw and Cowley collections (BM and ML, respectively); there is much evidence that the rest has been destroyed. The cerci of the females are now all missing, although Laidlaw (1926) refers to these as follows: "Several of the females have retained the long spatulate anal appendages which in this sex are so frequently broken off. The considerable number of specimens collected suggests that this insect usually counted quite a rarity, must be fairly abundant at least in certain localities and at certain seasons." (p. 226).

Features suggesting *uropetala*, even those of the immature examples, are that the body is as dark as in the allotype, the yellow lateral thoracic bands standing out clearly, and all have traces of greenish or bluish-grey spots on either side on top of frons.

The coloured postnodal clouds on the wings in the Atjeh specimen are definitely brownish and more extensive than in the allotype from Deli; in all females from the Mentawei group almost the entire membrane is of a dark yellowish brown tint, deepest between nodus and pterostigma, but the wing tips beyond the pterostigma remain entirely hyaline, the limit of the coloured area curving back before meeting the hind margin. Atjeh: nodal index $\frac{9.18.20.10}{11.15.13.13}$; $t\frac{2.3}{2.2}$; ht $\frac{2.3}{3.2}$; anal loop 3—4-celled. Mentawei Is.: *Ax* 17—21 in fore wings, 11—14 in hind wings; *Px* 8—9 in fore wings, 9—12 in hind wings; 2 cross-veins in *t* of all wings; 0—3 cross-veins in *ht* of fore wings, 1—2 in hind wings; anal loop 3-celled (one ex. with only 2 in left hind wing).

In the specimen from Atjeh the dorsum of the tenth tergite is devoid of any denticles, whereas in all Mentawei insects except one (from Siberut I.) the upper surface of this segment is strongly denticulate on each side of the median ridge.

The dimensions are: abd. 44.0, hind wing 42.0, pt. fore wing 3.4 mm (Atjeh); 39.0—42.5, 37.5—39.4, 2.6—3.3 mm (Mentawei Is.).

Evidently closely related to *O. foliacea*, with which it was first confounded, but quite distinct, the male on close inspection being easily recognised by the shape of the anal appendages.

Oligoaeschna spec. indet. C

Material. — B o r n e o : ♀ (semiad.), W. Borneo, Pontianak, 5.IV.1931, L. Coomans de Ruiter (ML).

A puzzling insect which I had first thought to be the female of *O. foliacea*, the shape of the cerci being very similar in the two. Both are from the same area in West Borneo but can be told apart by the key characters. It is worth noting that although *O. foliacea* has broader wing bases, the present species has a greater number of cells in the anal area.

Distribution. — W. Borneo.

Oligoaeschna petalura spec. nov.
Fig. 8

Material. — Hainan I.: ♂ (holotype, BM), Hainan, Mt. Wuchi, 24.5.03, 1911—288, *Jagoria* sp., det. D. E. Kimmins.

A dark-coloured species with rather narrow wings, open venation and a slender, not spindle-shaped abdomen.

Labium yellow-brown, labrum black, mandible-bases yellowish. Clypeus very dark reddish brown, postclypeus with linear midbasal stripe of ochraceous-orange, the side-edges remaining dark brown. Anterior surface of frons rather strongly convex, dorsal crest hardly indicated, the transition almost rounded; colour deep black marked on either side above with a transverse yellow stripe placed away from base for about twice its own breadth and running down parallel to the eye margin almost as far as the fronto-clypeal suture. Vertex, occipital triangle, rear of the head and all of the pubescence, black.

Synthorax brownish black, almost black; dorsal markings obscured though discernible as a pair of the usual elongate-oval green antehumeral bands, incomplete above, and a

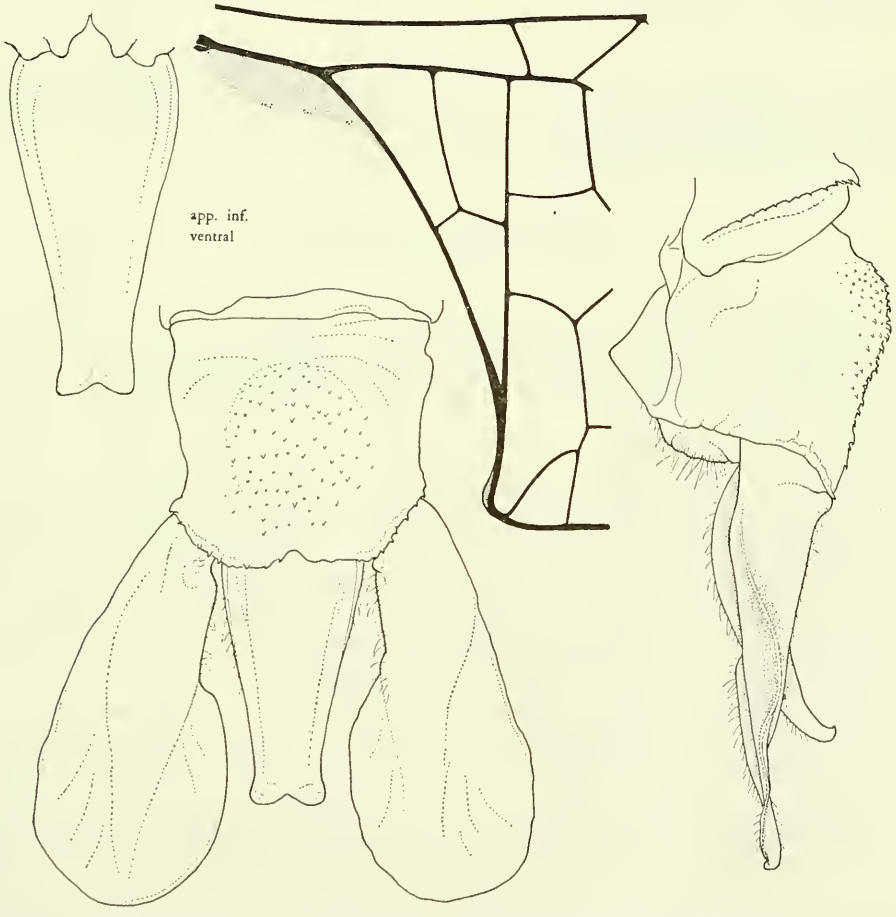

Fig. 8. *Oligoaeschna petalura* spec. nov., ♂ holotype from Hainan I.

pair of transverse oval spots of the same colour placed in front of the ante-alar triangles, which themselves are black. Sides with two broad, parallel-sided, green (?) meso- and metepimeral bands, the latter only little narrower than the black space separating them; latero-ventral border and most of the ventral surface of the thorax black.

Legs, including the femora interiorly, black.

Wings slightly tinged with greyish yellow all over the membrane, bases unmarked. Nodal index $\frac{10.21.19.10}{12.14.15.11}$; cross-veins in *t* $\frac{2.2}{3.3}$, in *ht* $\frac{2.2}{2.2}$; anal loop 3-celled. Discoidal triangles relatively long, proximal side in fore wing about half as long as costal side. Area posterior to Cu_2 in hind wing with moderately distinct, oblique sectors which enclose rows of four cells at a maximum between Cu_2 and posterior border; only two cells between apex of loop and posterior border.

Abdomen shaped and coloured as described in the key, all markings of small size, though clearly defined. Auricles almost rectangulate, shaped and armed similarly to *O. uropetala* spec. nov.

Measurements: abd. + app. 54.0, hind wing 42.5, pt. fore wing 3.0 mm.

Female unknown.

Distribution. — Hainan I.

Immediately distinguished from other tropical species by the leaf-like superior appendages, the obscuration of the face, and the almost black ground colour of the body. Possibly most closely related to *O. uropetala* spec. nov.

Oligoaeschna amata (Foerster)
Fig. 9

Jagoria amata Foerster, 1903: 1—2 sep. (♂ Brunei).

Jagoria poeciloptera Karsch, 1889: 238 (key, ♂ Singapore only), 239 (♂ Singapore only). — Martin, 1909: 132—133, fig. 129 (♂ app., Borneo only); 1911: 18 (id.).

Oligoaeschna amata: Lieftinck, 1940: 377, 380—381, 384, fig. 16 (♂ wing base, Borneo); 1954: 96, 183.

Material. — Borneo: ♂ (lectotype AAM), Brunei, Nord Borneo, Dr. O. Staudinger / *Jagoria amata* Foerster Type ♂ (in F. Förster's writing). ♂ (juv., ex alcohol), Singapore. *Jagor.* (yellow, unknown hand), 2394 (print), Syntypus (print on red), *Jagoria poeciloptera* Karsch 1889, det. K. K. Günther (ZMB). 5 ♂, *Oligoaeschna poeciloptera* Karsch, on green and red labels with suffix Bornéo (3 ♂), S. Borneo (♂) and Brunnei (♂), all in R. Martin's and Selys's writings (MP, one ♂ in ML). Position doubtful: ♀, Bornéo, no. 95.68, prés. by R. Martin (BM).

A small, slenderly built species. The specimens listed above include not only the *O. amata* investigated by me earlier but also one of the two males on which Förster based his description, this being here selected as the lectotype. An examination of the male from Singapore, doubtfully referred to *Jagoria poeciloptera* by Karsch, proves beyond doubt that this is not the same species as the female from Luzon — of which Karsch gave a much fuller description — but that it is conspecific with *O. amata.* After indicating briefly the wing colour of this male — a spirit specimen in poor condition — Karsch merely says of it: "Vielleicht eigene Art". This remark has led me to select the female

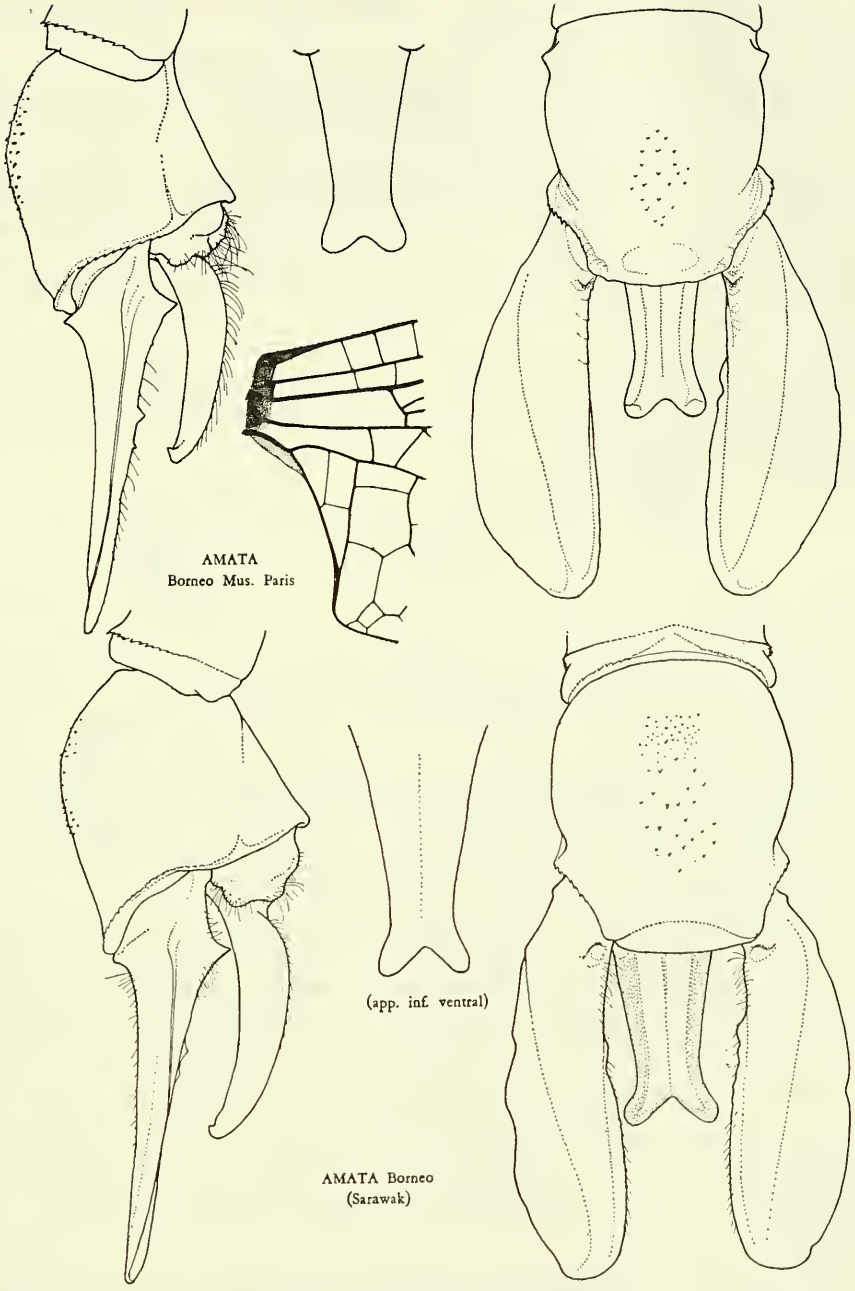

Fig. 9. *Oligoaeschna amata* (Foerster), structures of two ♂ from Borneo

rather than the male as the lectotype of the Philippine species *O. poeciloptera* (Karsch), the male of the latter remaining unknown.

Some venational details, taken from 8 males of *O. amata*, follow.

Neuration open. *Ax* 16—19 in fore wings, 11—13 in hind wings; *Px* 7—10 in fore wings, 9—11 in hind wings; 2 cross-veins in *t* of all wings; 1—2 cross-veins in *ht* of fore wings, 0—2 in hind wings; anal loop 3-celled (in one wing 4 cells).

Structural features of two slightly different males from Borneo are shown in Fig. 9. The anal appendages of the Singapore specimen are still in good shape and quite similar to those of the Bornean examples.

Measurements: abd. + app. 41.0—45.0, hind wing 33.4—36.8, pt. fore wing 2.0—2.4 mm (lectotype 45.0, 36.8, 2.0 mm, respectively).

Female unknown.

(I have not succeeded to find a suitable female for this species. We may expect it to be very similar to that of *O. mutata* Lieft. and, like that, to possess uncoloured wings and a spindle-shaped abdomen).

Distribution. — Borneo and Singapore.

Oligoaeschna mutata Lieftinck
Fig. 6—7

Oligoaeschna mutata Lieftinck, 1940: 381—385, fig. 18 (♂ app., Borneo); 1954: 98, 183 (♂ ♀ Borneo).

Material. — Borneo: ♂, 2 ♀, E. Borneo, Kutai, Samarinda, I.1939, M. E. Walsh (♂ holotype), and same area, Sangkulirang distr., Kariorang, 2.I.1937 (♀ paratype) and 21.II.1937 (♀ allotype), both J. W. Q. de Quarles (ML).

No new material. One of the smallest species known; its main characters are mentioned in the keys and original description, the figures accompanying the latter being reproduced in Fig. 6. From its nearest ally, *O. amata*, the male of *mutata* can be separated at once by the slightly less prominent anal angle of the hind wing and also by having the apical segments of abdomen not at all enlarged or swollen.

In stature and markings the female resembles our *spec. indet. A*, likewise from East Borneo, but can be distinguished therefrom by the more open neuration, the presence of only a single cell-row M_4-*Mspl* and by having the abdomen markedly spindle-shaped. There are invariably 2 cross-veins in *t* and in all wings of the types of *O. mutata* there is only a single cross-vein in the hypertriangles (*ht*); this is evidently a variable character since the formula for the second female is $\frac{2.2}{1.2}$. Male: *Ax* 15—16 in fore wings, 11 in hind wings; *Px* 8—9 and 9—10, respectively. Females: *Ax* 15—17 and 11—14, respectively; *Px* 7—9 and 10—11, respectively.

Measurements: ♂ abd. + app. 42.5, hind wing 34.0, pt. fore wing 2.0 mm.

Distribution. — Borneo.

Oligoaeschna sumatrana Lieftinck
Fig. 10

Oligoaeschna sumatrana Lieftinck, 1953: 253—255, fig. 8 (♂ app., Sumatra); 1954: 98, 184 (♂ Sumatra).

Material. — Sumatra: ♂ (holotype, ML), W. Sumatra, Mt. Kerintji (Peak of Indrapura), Kaju Aro Estate, 1600 m, 30.X.1952, R. Straatman.

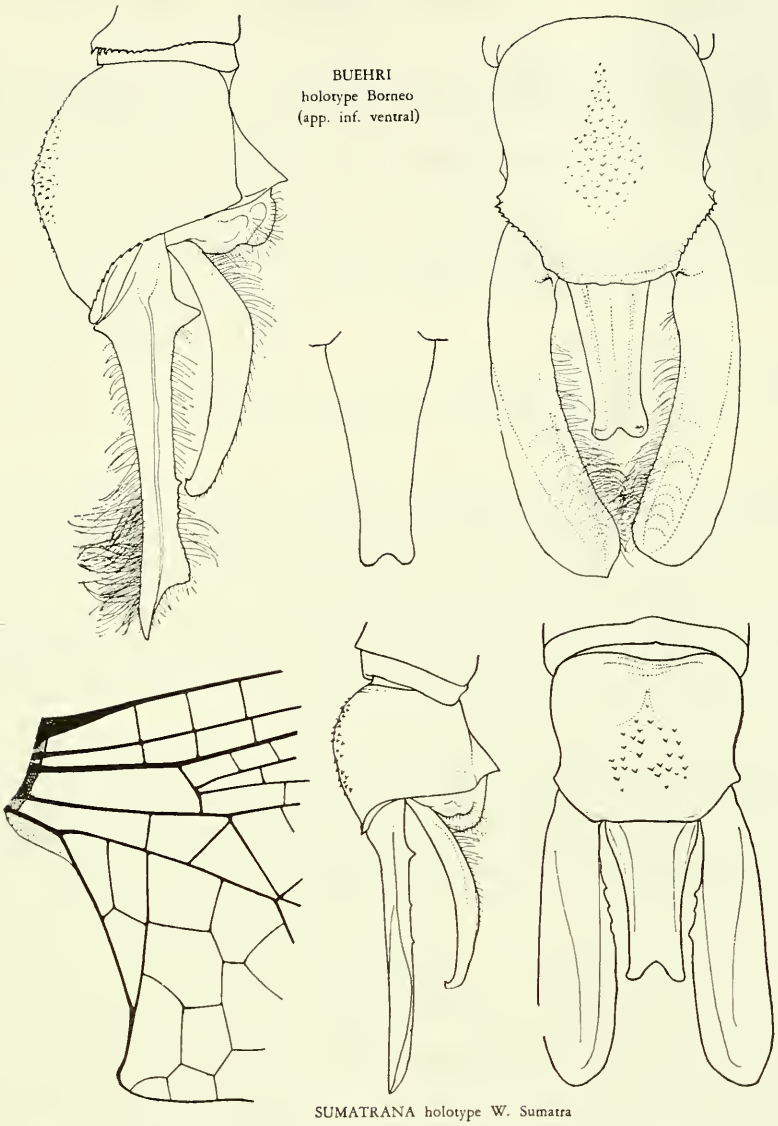

Fig. 10. *Oligoaeschna buehri* (Foerster), ♂ and *O. sumatrana* Lieft. (after Lieftinck, 1953), not drawn on the same scale

Known only from the type. Ground colour very dark brown, markings well defined, probably olive-green during life. Lateral thoracic bands faded and discoloured; legs reddish brown.

Neuration open. Nodal index $\frac{7.15.15.6}{8.11.\ 9.9}$; 2 cross-veins in *t*, $\frac{1.2}{2.2}$ in *ht*; anal loop 3-celled. Discoidal triangles relatively short, proximal side in hind wing about ⅔ length of costal side. Pterostigma small, brownish ochreous; membranula grey.

Measurements: abd. + app. 52.5, hind wing 41.0, pt. fore wing 2.4 mm.

Female unknown.

Distribution. — West Sumatra.

Distinguished from all other regional species by the almost parallel-sided segments 5—9 of the abdomen and the simple form of the superior appendages (Fig. 10).

O. sumatrana is the only species known to occur in the mountain region of Malaysia.

Oligoaeschna buehri (Foerster)
Fig. 7 and 10

Jagoria bühri Foerster, 1903: 2 sep. (♂ Brunei). — Martin, 1909: 131—132, fig. 128 (♂ app., Brunei); 1911: 18 (id.).

Oligoaeschna bühri: Lieftinck, 1940: 377, 378, 384 (♂ key, Borneo); 1953: 255 (♂ Sumatra); 1954: 97, 183 (Sumatra, Borneo).

Material. — Borneo: ♂ (holotype, AAM), Brunei, Nord Borneo, Dr. O. Staudinger / *Jagoria Bühri* Foerster Type ♂ (in F. Förster's hand). 2 ♂, *Oligoaeschna Bühri* Förster, on yellow labels with suffixes Bornéo and Brunnei, in R. Martin's writing (MP). 3 ♂ (2 juv.), E. Borneo, Kutai, Tabang, 125 m, Bengen river, 13.X.1956 (1 ad.), id., Kembang Djangut, 75 m, 30.XI.1956 (1 juv.) and Gunungsari, 95 m, 23.VIII.1956 (1 juv.), all A. M. R. Wegner (ML). Sumatra: ♂ (ad.), NE. Sumatra, Deli, Laut Tador, 90 m, 17.III.1949, R. Straatman, and ♀ (juv., cerci intact), same locality, 25.VIII.1949, same collector (ML).

The male of this species is easily distinguished from all others of the same group by the characteristic shape of the 10th abdominal segment and superior appendages, other features being given in the key. The type, now also before me, is still in good condition and differs in no way from the other males from Borneo discussed in my last account (1940) of Malaysian *Oligoaeschna*. The discovery of a male and female in Sumatra means an interesting addition to the known range of *O. buehri*, thus far known only from Borneo. The female from the same locality corresponds with immature specimens of the other sex in the shape of its wings and discoidal triangles, the course of the main veins and their supplements and in the coloration of the body. Although *O. uropetala* has been collected also at Laut Tador, I believe the sexes are correctly associated.

The following venational characters are based on the examination of 1 male from Sumatra and 6 from Borneo. Borneo: *Ax* 17—20 in fore wing, 12—13 in hind wing; *Px* 8—11 in fore wing, 9—13 in hind wing (holotype: $\frac{10.18.20.\ 9}{11.13.11.10}$); cross-veins in *t* of fore wing 2 (exceptionally 3), in hind wing 2—3 (holotype: $\frac{2.2}{2.1}$); cross-veins in *ht* of fore wing 1—2, in hind wing 0.2 (holotype: $\frac{2.1}{1.1}$); cells in anal loop variable (3, 4, 5 or even 6; in holotype 3). Sumatra: $\frac{8.15.15.7}{10.10.11.9}$; $t\frac{2.2}{2.2}$; $ht\frac{2.2}{1.2}$; anal loop 3-celled.

Dimensions. Borneo: abd. + app. 44.2—48.3, hind wing 34.5—41.3, pt. fore wing 2.1—2.3 mm (holotype: 44.2, 34.5, 2.0 mm, respectively); Sumatra: 48.5, 37.4, 2.3 mm.

Distribution. — Borneo and Sumatra.

Oligoaeschna spec. indet. D

Material. — Borneo : ♀ (juv.), Br. N. Borneo, Dent Province, Mt. Marapok, coll. G., with label in R. Martin's writing: *Jagoria poeciloptera* Karsch ♀ (ML).

Previously referred by me to *O. amata* with some misgivings. It can not, however, be identical with that species because of the different venation. The vein M_4 in both fore and hind wings of the present specimen is only slightly bent whereas in the wings of *O. amata* the distal half of this vein has a distinctly wavy course. The more strongly curved Cu_1 and Cu_2, the shorter discoidal triangles, as well as the broad anal fields also separate this female from *O. amata.*

Distribution. — NW. Borneo.

Oligoaeschna venatrix (Foerster)
Fig. 11

Jagoria venatrix Foerster, 1903: 2—3 sep. (♂ Insel Buton südlich Celebes). — Martin, 1909: 133—134, fig. 130 (♂ app., Buton); 1911: 18.

Material. — Buton I.: ♂ (holotype, AAM), Insel Buton südl. Celebes, Rolle vdt. 1903 / *Jagoria venatrix* Foerster. Type, both labels in F. Förster's writing. Celebes : ♂, Central Celebes, Luwu distr., Masamba, Lamasi, "forest marsh", 8.IV.1941, L. L. A. Maurenbrecher (ML); ♀ (intact), West Celebes, Masimbah near Polewali, 500 m, 18.III.1940, J. J. van der Starre (ML).

Male. — Mouth parts and face ochraceous-orange to dark brown, all of the wrinkled anterior surface of frons including the crest brownish black to black, as are also the vertex, occipital triangle and rear of the head. Thoracic markings arranged as in the Malaysian species, the green lateral bands relatively less broad, narrower than the interspace; vestiges only of a subcircular superior spot and an elongate inferior streak of the same colour, placed in line on the metepisternum.

Venation open. Nodal indices $\frac{8.21.18.\ 9}{10.14.12.10}$ (holotype, Buton) and $\frac{8.18.19.10}{11.12.14.12}$ (Celebes); 2 cross-veins in *t* of all wings (both males), only 1 in *ht* of all wings (type, Buton), or $\frac{0.0}{1.1}$(Celebes); *Bxs* $\frac{2.1}{1.1}$ (type, Buton) or $\frac{0.1}{0.0}$(Celebes). Only 2 cells between apex of 3-celled anal loop and posterior border of hind wing. Anal angle almost acute, distinctly protuberant, the posterior margin of the wing being slightly concave between anal angle and widest part of wing at level of main fork.

Auricles yellow, subtriangular in outline but not very prominent, armed posteriorly with rows of more than 20 minute, closely set, recurved black denticles. Pale spots on segments 1—2 bright green, the elongate basolateral blotches of 3—9 ill-defined, ochreous brown, occupying about one-third the length of segments and apparent also on the ventral surfaces of the tergites.

The type is an aged individual, generally darker than the one from Celebes, but otherwise the two males resemble each other closely except for the slightly different shape of the appendages, which are here figured for both (Fig. 11). It will be seen that the superiors of the male from Celebes are decidedly longer than they are in the Buton

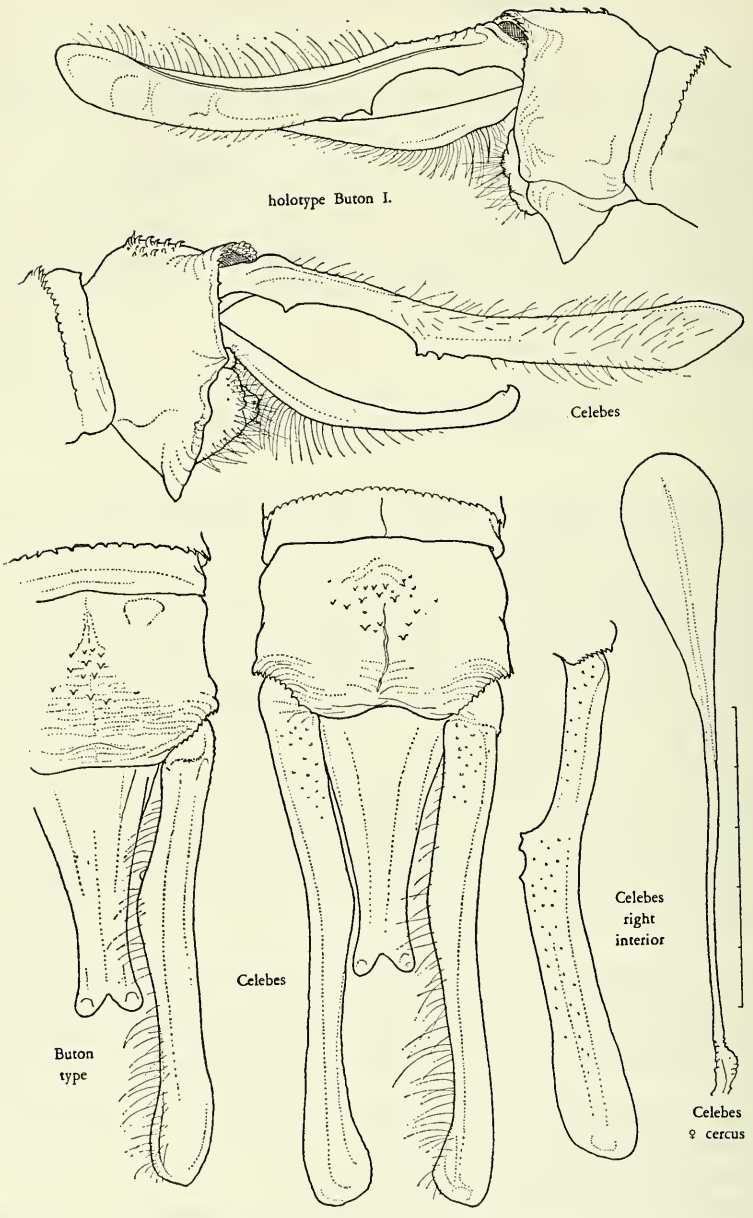

Fig. 11. *Oligoaeschna venatrix* (Foerster), ♂ holotype from Buton I. and ♂ ♀ from Celebes. Scale line = 5 mm. Corresponding figures on the same scale

specimen. Only a single example from either locality being known I do not venture to say whether this difference is due to individual variation or the formation of geographical subspecies.

Female (immature). — Conforms with the male in most respects, though unfortunately the abdominal segments, with the exception of the basal ones, are compressed and

deformed by pressure. The ground colour of the body is lighter and the pale markings on nearly all abdominal segments have not yet developed their full colours. Mouth-parts and face brown, rest of the head as described in the key. Dorsal thoracic spots green, lateral bands sharply defined, bright yellow; no traces of metepisternal pale spots. Legs reddish brown, all femora obscured apically.

Wings as described, basal part more densely reticulated than in male. Nodal index $\frac{9.17.17\ 9}{10.12.13.11}$; 2 cross-veins in *t*; *ht* $\frac{2.1}{1.1}$; *Bxs* $\frac{2.1}{2.1}$; anal loop 4-celled.

Cerci exceedingly long, shaped as in Fig. 11; dentigerous plate compressed and unfit for figuring but resembling that of all Malaysian species in having a row of irregularly placed marginal spines.

Measurements: ♂ abd. + app. 52.2 (48.0 + 4.2), hind wing 42.0, pt. fore wing 3.0 mm (holotype, Buton); 53.0 (48.3 + 4.7), 43.5, 3.0 mm, respectively (Celebes); ♀ 43.0 + 10.7, 44.3, 3.2 mm, respectively.

A very remarkable species, previously known only from the type collected in the island of Buton, off southeast Celebes, but presently reported also from continental Celebes. *O. venatrix* is the only member of its genus known to occur east of Wallace's Line and south of Mindanao. It has no near allies, differing from its congeners chiefly with regard to stature, abdominal markings and peculiar shape of appendages. In these respects the species deviates more from the Malaysian and Philippine species than the latter differ among themselves. By its long appendages the male of *O. venatrix* is somewhat reminiscent of *Linaeschna polli* Martin, from Borneo. However, in spite of the rather unusual colour-pattern of the body as compared with that of others in the *O. poeciloptera* group, *venatrix* is a true *Oligoaeschna*. The female possesses very long cerci, like those of all remaining species occurring in tropical countries. It was taken by hand while at rest, suspended on a branch among foliage, but nothing else is known of its habits.

Distribution. — Celebes; Buton I. (terr. typ.).

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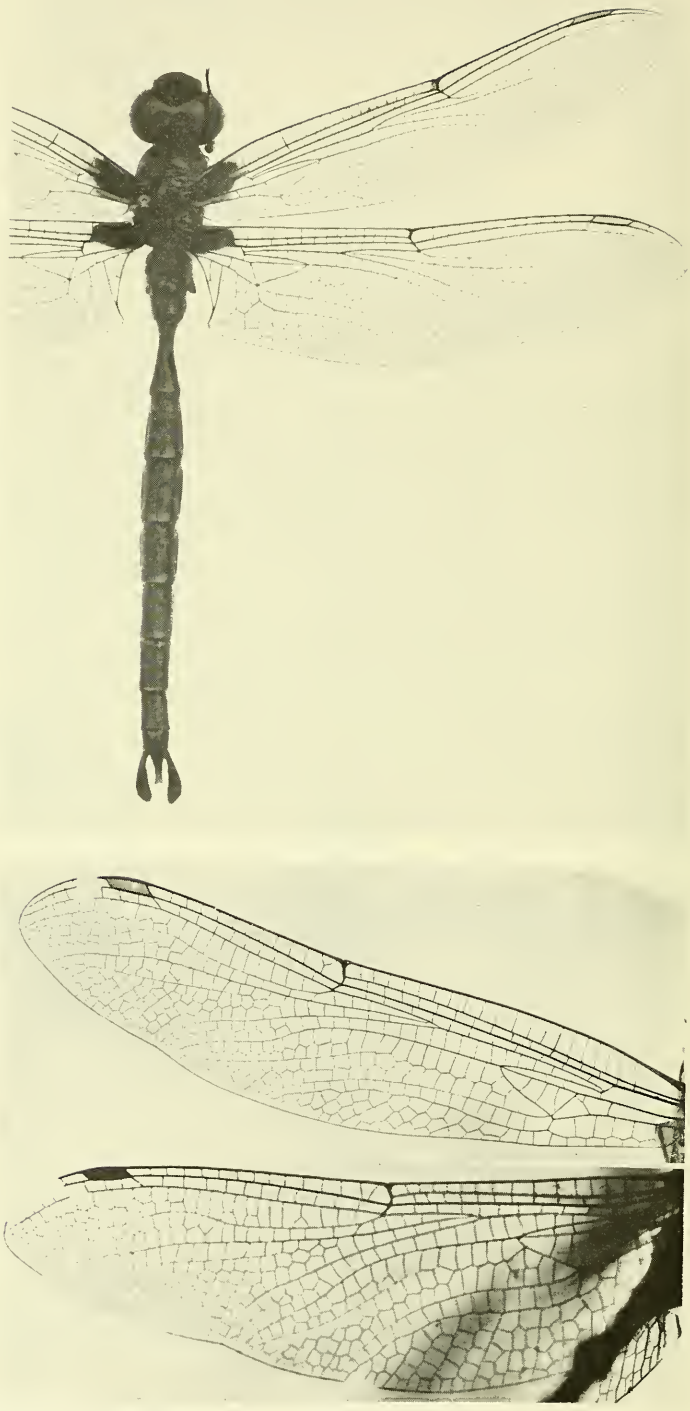
Above: *Oligoaeschna decorata* spec. nov., ♀ holotype from Shillong, Assam. — Below: *Oligoaeschna poeciloptera* (Karsch), ♀ lectotype from Luzon, P.I.



Above: *Oligoaeschna venusta* spec. nov., ♂ holotype from E. Borneo. — Below: *Oligoaeschna modiglianii* Selys, ♂ holotype from Nias Island, left fore wing and right hind wing

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REVISION OF THE NOMINATE SUBGENUS SCELIPHRON LATREILLE (HYM., SPHECIDAE) (STUDIES ON THE SCELIPHRONINI, PART I)

by

J. VAN DER VECHT [1]) and F. M. A. VAN BREUGEL [2])

ABSTRACT

This first part of a revision of the sphecid genus *Sceliphron* sensu Kohl (1918) deals with 18 species, arranged in two species groups; the third group of *Sceliphron* s. str. as now restricted by the exclusion of *Chalybion* Dahlbom and *Hemichalybion* Kohl is raised to subgeneric rank (*Prosceliphron* van der Vecht, subg. nov.; type species *Sc. coromandelicum* (Lep.)). The paper is to be regarded as a supplement of Kohl's revision; it contains keys to the species and subspecies, detailed information on some previously overlooked characters and accounts and maps of the distribution. The confused synonymy of the two African species of the *madraspatanum*-group is unravelled. The Cuban species *Sc. argentifrons* (Cress.) is regarded as different from *Sc. fasciatum* (Lep.) inhabiting Hispaniola and Guadeloupe; *Sc. lucae* (Sauss.) is treated as a subspecies of *Sc. jamaicense* (F.). Three new subspecies are described: *Sc. madraspatanum formosanum* van der Vecht, *Sc. javanum chinense* van Breugel, and *Sc. laetum maindroni* van der Vecht.

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Fig. 1. *Sceliphron* (*Sceliphron*) *fistularium* (Dahlb.), ♀ (Suriname, Kayser Airstrip) (3.7 ×)

INTRODUCTION

This paper deals with two groups of wasps which have been called the "*madraspatanum*-group" and the "*spirifex*-group" in a preliminary communication by the senior author (Van der Vecht, 1961). The most recent revision of these insects is to be found in Kohl's monograph "Die natürliche Gattung *Sceliphron* Klug", published exactly fifty years ago. In this work the species discussed below were treated by Kohl as members of a subgenus *Pelopoeus* Latreille (correctly called *Sceliphron* s. str.), together with a number of species which in 1961 were placed in the "*coromandelicum*-group" and for which now a subgenus is erected. The genus *Sceliphron* sensu Kohl also included the subgenera *Chalybion* Dahlbom and *Hemichalybion* Kohl, which are now regarded as separate genera. The senior author hopes to revise these latter taxa in the near future.

Although Kohl's work is now out of date, it is still a valuable tool for the study of these wasps. As its main shortcomings we may mention: (1) Kohl's material of the Indo-Australian species was rather incomplete, (2) he paid insufficient attention to the relationship of the species and to the geographic variation within some of the species, and (3) he underestimated the taxonomic value of certain characters, particularly the structure of the terminal sternite and the genitalia of the male (Kohl, 1918: 8, wrote: "die Genitalklappen der Sceliphrone weisen keine artliche Mannigfaltigkeit auf und dürften bei der Artunterscheidung kaum je von Wert sein"). In the present paper we have therefore paid special attention to these subjects. Furthermore we found it necessary to change the status of a few forms treated by Kohl as distinct species, to correct some errors in the identification of species described by previous authors, and to present the available information on the distribution of the species and subspecies in a more convenient manner. Yet our work is to be regarded as a supplement to Kohl's monograph, and the two revisions should therefore be used together.

It is of interest to note that since the publication of Kohl's work no new species of the subgenus *Sceliphron* have been discovered. Since only one of the species is really rare in collections and exclusively known in the female sex, and since most of the species are more or less widely distributed and rather conspicuous insects, the discovery of additional species seems very unlikely. And although it is true that some parts of the world have not yet been sufficiently explored in this respect, it is evident that our knowledge of the distribution is sufficiently complete to serve as a firm base for conclusions on the zoogeography of this group. It is particularly for this reason that we have attempted to summarize the available data on distribution in some maps.

Since the appearance of Kohl's revision, some of the species discussed below have been dealt with in studies on a regional basis. Thus Porter (1926) published a paper on the American species of the genus *Sceliphron* (s. str.), and Bohart and Menke treated the North American species in their valuable reclassification of the Sphecinae (1963). Arnold (1928) discussed the African species in his well-known monograph of the Sphecoidea of South Africa; in 1955 Leclercq summarized our knowledge of the species of this region in an important study of the African Sphecinae. These papers should be consulted for additional information on the American and African species.

As we have now studied extensive collections from the Indo-Australian area, it seems to us that particularly further collecting in southwestern Asia is likely to yield important results. In any case it is here that the unknown male of *Sceliphron pietschmanni* Kohl will eventually be discovered. With regard to the bionomics of the various species,

important work on such topics as nest construction, prey selection, parasites, etc. is still to be done in many areas. It is intended to discuss this subject in a future paper in this series.

The material used for this study is preserved in the collections of the following museums and private entomologists.

AMNH = American Museum of Natural History, New York, U.S.A.
BISH = Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A.
BM = British Museum (Natural History), London, England.
BPI = Bureau of Plant Industry, Manila, Philippines.
CAS = California Academy of Sciences, San Francisco, Calif., U.S.A.
CNHM = Chicago Natural History Museum, Chicago, Ill., U.S.A.
CU = Cornell University, Dept. of Entomology, Ithaca, N.Y., U.S.A.
DEI = Deutsches Entomologisches Institut, Eberswalde, East Germany.
IRSNB = Institut Royal des Sciences Naturelles, Brussels, Belgium.
KU = University of Kansas, Lawrence, Kans., U.S.A.
KVK = coll. Dr. Karl V. Krombein, c/o U.S. National Museum, Washington D.C., U.S.A.
LAM = Los Angeles County Museum, Los Angeles, Calif., U.S.A.
MBUD = Hungarian Natural History Museum, Budapest, Hungary.
MCG = Museo Civico di Storia Naturale, Genova, Italy.
MCZ = Museum of Comparative Zoology, Cambridge, Mass., U.S.A.
MHNG = Musée d'Histoire Naturelle, Geneva, Switzerland.
ML = Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands.
MP = Muséum National d'Histoire Naturelle, Paris, France.
MR = Natuurhistorisch Museum, Rotterdam, Netherlands.
MT = Museo di Zoologia della Università, Torino, Italy.
MZB = Museum Zoologicum, Bogor, Indonesia.
NMB = Naturhistorisches Museum, Basel, Switzerland.
NMSR = National Museum of S. Rhodesia, Causeway, Rhodesia.
NMW = Naturhistorisches Museum, Vienna, Austria.
NRS = Naturhistoriska Riksmuseum, Stockholm, Sweden.
OUM = Oxford University Museum, Oxford, England.
PV = coll. P. M. F. Verhoeff, Den Dolder, Netherlands.
UMMZ = University of Michigan, Museum of Zoology, Ann. Arbor, Mich., U.S.A.
USNM = United States National Museum, Washington D.C., U.S.A.
UZMC = Universitetets Zoologiske Museum, Copenhagen, Denmark.
WAM = Western Australian Museum, Perth, W. Australia.
ZMB = Zoologisches Museum der Humboldt-Universität, Berlin, East Germany.

We are greatly indebted to the authorities and hymenopterists of the various museums as well as to the owners of private collections for enabling us to study the material in their care. Our special thanks are due to Dr. Delfa Guiglia, Genoa, who with the cooperation of Dr. U. Parenti in Turin helped us to solve the problem of the identity of *Pelopoeus fasciatus* Lepeletier.

In 1963 Dr. Karl V. Krombein, Smithsonian Institution, Washington, kindly took the trouble to concentrate much material, preserved in several American museums, in the

U.S. National Museum, thus greatly facilitating the study of these specimens by the senior author during a stay in Washington, D.C.[1]).

For preparing the drawings illustrating this paper the authors have been assisted by Mr. W. Bergmans, formerly Rijksmuseum van Natuurlijke Historie (Fig. 2—4) and Mr. H. Heijn, Dept. of Systematic Zoology, University of Leiden (Fig. 1, 9, 16, 17, 19, 24); the junior author made the drawings for Fig. 5—7, 10—12, 20—23, and 25—27; the senior author is responsible for the remaining ones.

The literature references at the end of the paper are restricted to some papers which have appeared during the last half century; for earlier publications we refer to Kohl, 1918. A comprehensive bibliography will be withheld for the final part.

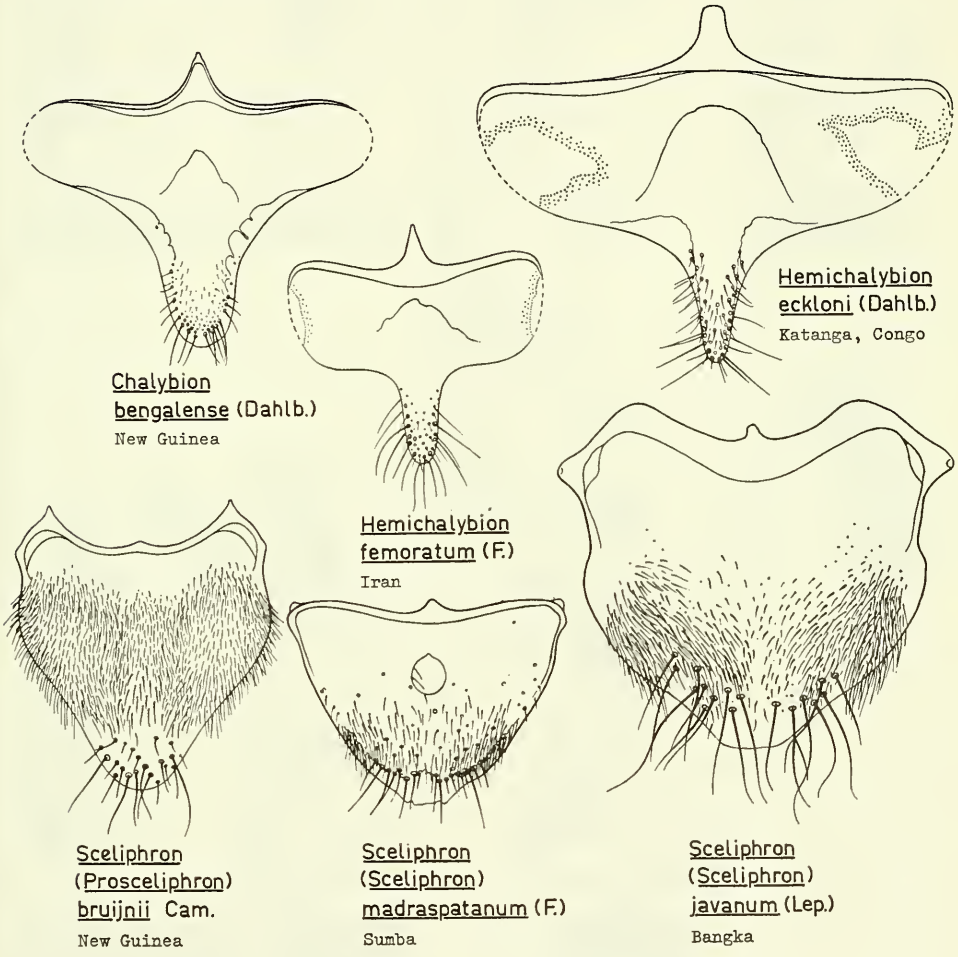

Fig. 2. Terminal sternite of the male of some Sceliphronini

[1]) The investigations on the American material were supported by a grant from the National Science Foundation (no. GB-660 (201D-308)).

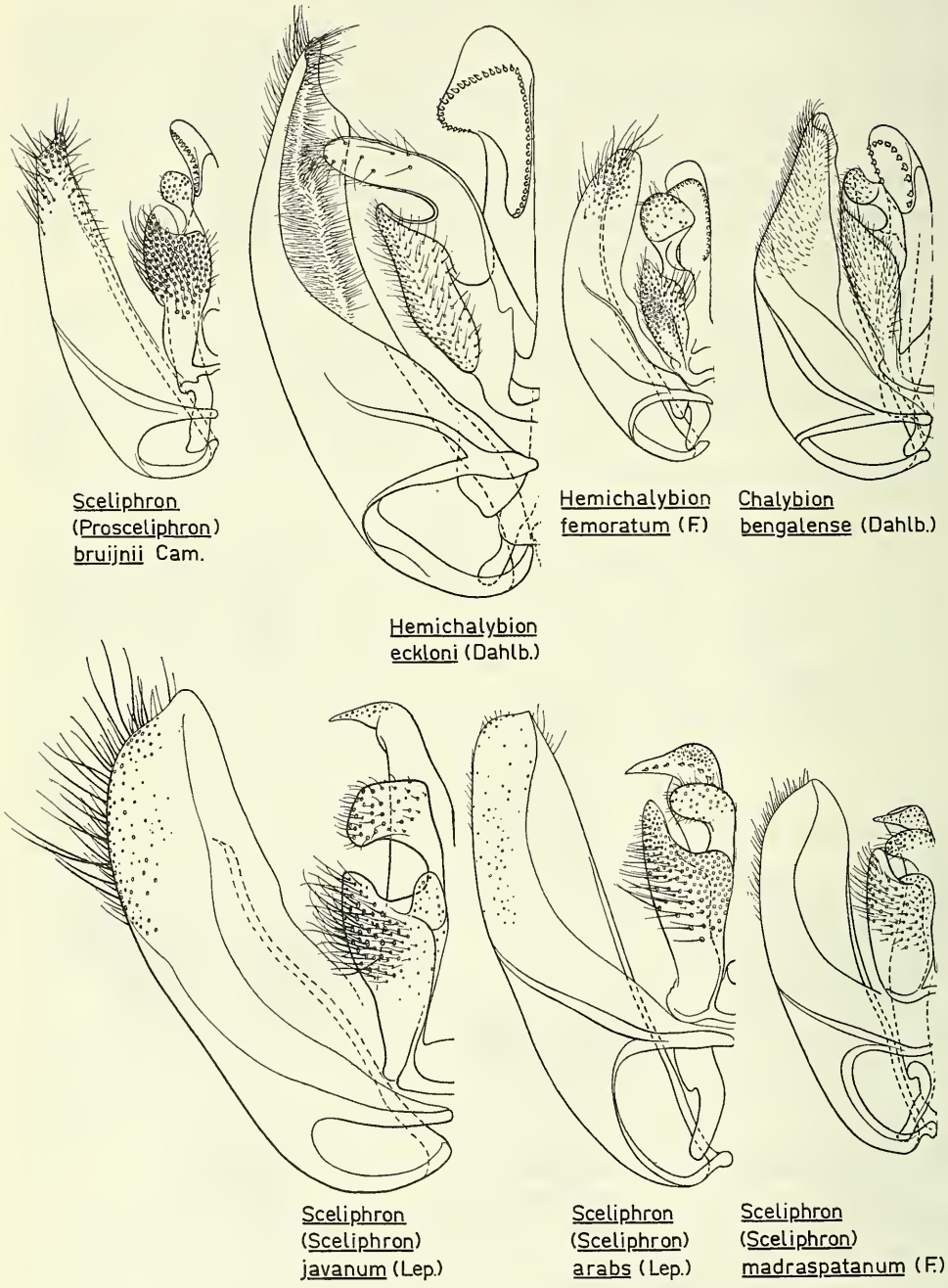

Fig. 3. Ventral view of male genitalia of some Sceliphronini (cf. Fig. 4)

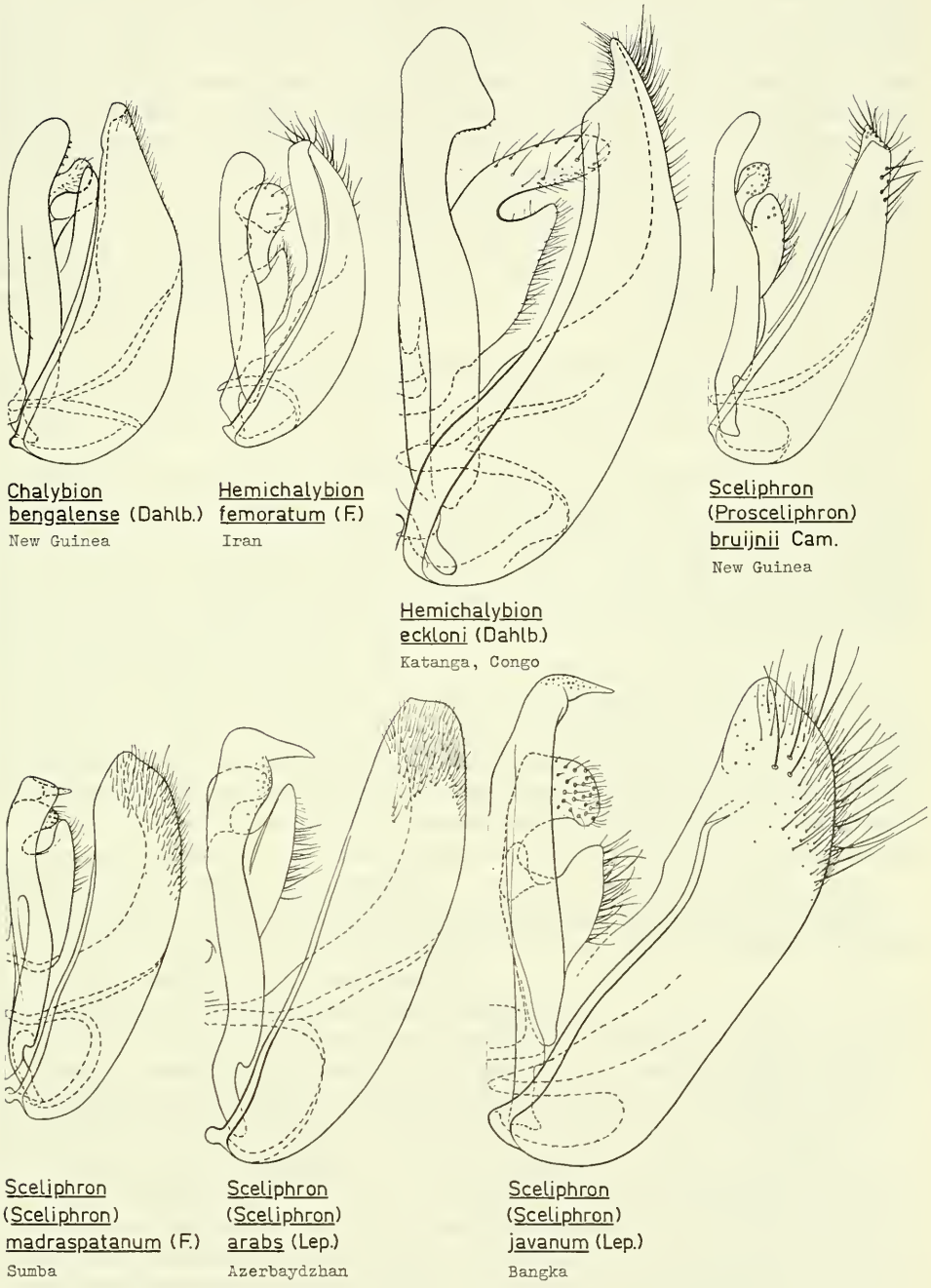

Fig. 4. Dorsal view of male genitalia of some Sceliphronini

GENERIC AND SUBGENERIC DIVISIONS

Several early authors, including Patton (1880), Ritsema (1880), Radoszkowski (1891), and Pérez (1905), have regarded *Chalybion* as a separate genus. Kohl was generally inclined to recognize rather large genera, and this may have been one of the reasons why he did not accept this view. There are moreover some special difficulties connected with the recognition of *Chalybion* as a group of generic rank. One of these is the position of the species placed by Kohl in the subgenus *Hemichalybion*, a group which is restricted to the Ethiopian and Oriental regions, and which was regarded by Kohl as transitional between *Chalybion* and *Sceliphron*.

The Old World authors (Arnold, de Beaumont, Guiglia, Yasumatsu) have generally accepted Kohl's classification, but Leclercq (1955) and most American authors (Pate, Porter, Rau) have treated *Chalybion* as a separate genus. These latter workers were probably insufficiently acquainted with the *Hemichalybion* species to appreciate the difficulties arising from the intermediate position of this group. Leclercq solved the problem by treating *Hemichalybion* as a subgenus of *Sceliphron* (excl. *Chalybion*), but it seems very well possible that *Hemichalybion* is more closely related to *Chalybion* than to *Sceliphron* s. str.

In his provisional review of the group the senior author (Van der Vecht, 1961) adopted Kohl's classification and considered these groups as subgenera. In the present paper, however, we have followed Bohart and Menke (1963) who regard the group under discussion as comprising three genera (*Chalybion, Hemichalybion* and *Sceliphron*). Partly we do this for the sake of uniformity, for the rather generally adopted splitting up of the old genus *Sphex* into a number of genera requires a corresponding treatment of *Sceliphron* s.l. In addition, it has proved desirable to divide *Sceliphron* s. str. into two subgenera, differing in morphological as well as in ethological characters; yet these subgenera appear to be more closely related inter se than they are to *Chalybion* and *Hemichalybion*. These relationships are best expressed by giving the latter groups generic rank.

The genus *Sceliphron*, as it is now restricted by the exclusion of *Chalybion* and *Hemichalybion*, may be subdivided as follows:

1. Terminal gastral sternite of ♀ rather sharply keeled. Lower half of inner eye-margins almost parallel. Terminal tergite of ♂ with pygostyles. Second submarginal cell anteriorly wider than the third. Mandibles without tooth on inner side. Thorax dull, finely sculptured; metapleura finely granulate or transversely striate, dull . . . . . **Prosceliphron** van der Vecht, subgen. nov. (type species: *Sceliphron coromandelicum* (Lepeletier))

— Terminal gastral sternite of ♀ slightly convex, rarely feebly keeled. Lower half of inner eye-margins distinctly converging towards the clypeus. Terminal tergite of ♂ without pygostyles. If the second submarginal cell is anteriorly wider than the third, the mandibles of the ♀ have as a rule a distinct tooth on inner side. Thorax in the Old World species less dull, particularly the metapleura distinctly shiny (in the New World species finely granulate). . . . . *Sceliphron* s. str. 2

2. Hind coxae normal or somewhat swollen, rounded on outer side. Inner side of mandibles with a more or less distinct tooth . . . . . *madraspatanum*-group

— Hind coxae swollen on outer side, as seen from above or below distinctly angular. Mandibles simple, except in *Sc. arabs* (which is distinguished by the bituberculate scutellum). Sides of propodeum in most species more sharply and coarsely striate than in the *madraspatanum*-group . . . . . *spirifex*-group

In addition to the group characters discussed and figured at a previous occasion (Van der Vecht, 1961) we publish here some drawings of the terminal sternite and the genitalia of one or two males of each of the subdivisions of the old genus *Sceliphron* sensu Kohl (Fig. 2—4). They illustrate the high degree of similarity of the terminal sternite of *Chalybion* and *Hemichalybion*, and also show that in both these groups the rounded, sometimes strongly swollen, apex of the aedeagus is armed with a complete row of denticles. As stated in 1961, such denticles are also present in the species of the "*coromandelicum*-group" (= subgenus *Prosceliphron*). However, the conclusion that they are lacking in most of the other species of *Sceliphron* needs correction: it can now be said that the species of both the groups of *Sceliphron* s. str. show a tendency towards reduction of the denticles, as a rule associated with the formation of an apical tooth pointing in lateral direction.

Subgenus Sceliphron Latreille

A. Group of *Sceliphron madraspatanum* (F.)

Male genitalia: Fig. 5—7; pubescence of parameres usually short, but rather long in some insular species (*intrudens, fasciatum*); distal part of aedeagus (Fig. 7) with a row of teeth which may be more or less reduced, the apex bent in lateral direction to a varying degree, in the Old World species the apical part distinctly swollen and armed with a sharp tooth pointing in lateral direction; pubescence of volsellar cuspis very short in the African species; volsellar digitus rounded at apex on inner side in the Old World species (Fig. 8), here more or less angular in the American species, in which this part also shows greater specific differences (Fig. 14).

Key to the species of the *madraspatanum*-group

1. Mesepisternum more or less coarsely punctate, the interspaces in some species with microscopically fine puncturation, but not distinctly rugose; the mesepisternum thus as a rule shiny and usually more so than the striate sides of the propodeum. Mesepisternum with or without yellow mark beneath the tegulae. — Old World 2
— Mesepisternum distinctly rugose between the punctures, dull, not more shiny than the sides of the propodeum. Mesepisternum always with yellow mark beneath the tegulae. — New World 5
2. Tegulae marked with yellow; yellow markings on other parts of the body very variable (Fig. 10—12). Erect hairs of thorax yellowish-grey or whitish. — Mediterranean area to China and New Guinea . . . . *madraspatanum* (Fabricius)
— Tegulae brown or black, very rarely yellow in the African *Sc. quartinae*. Erect hairs of thorax often darker 3
3. Antennal scape orange-yellow anteriorly. Clypeus of ♂ produced anteriorly, depth of incision between the two rather sharp teeth equal to about 10% of interocular distance at the clypeus. Robust species with yellowish wings, superficially resembling *Sc. javanum*. Length ♀ 22—26 mm. — Celebes . . . . . *intrudens* (Smith)
— Antennal scape rusty brown or black. Anterior margin of clypeus of ♂ bluntly bidentate. Smaller species; length ♀ 16—22 mm. — Ethiopian region . . . 4
4. Hind coxae moderately convex at base on outer side (Fig. 13c). Pronotal collar relatively long, the anterior face not falling steeply away from the dorsal face (Fig.

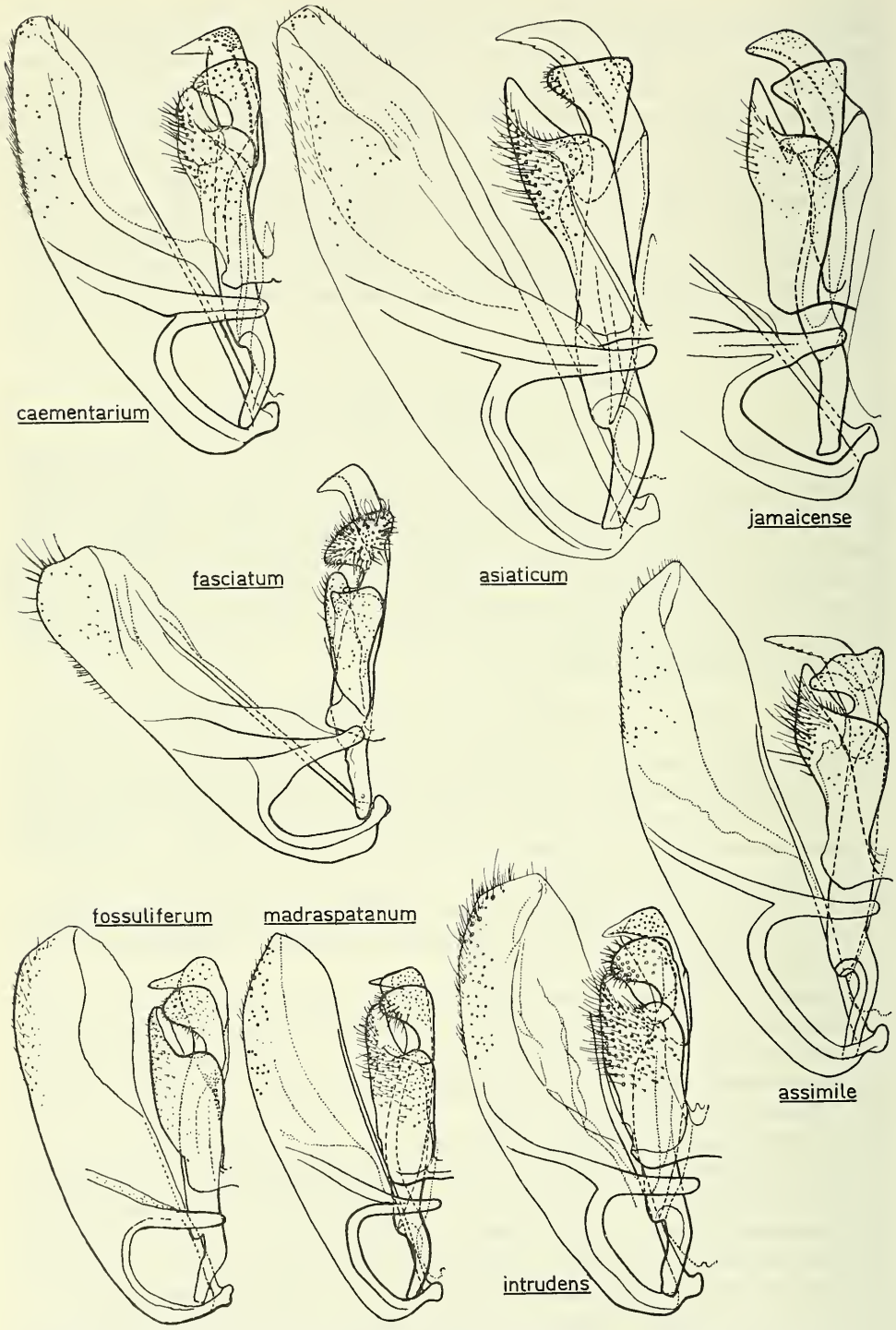

Fig. 5. Ventral view of male genitalia of species of the *madraspatanum*-group (cf. Fig. 6)

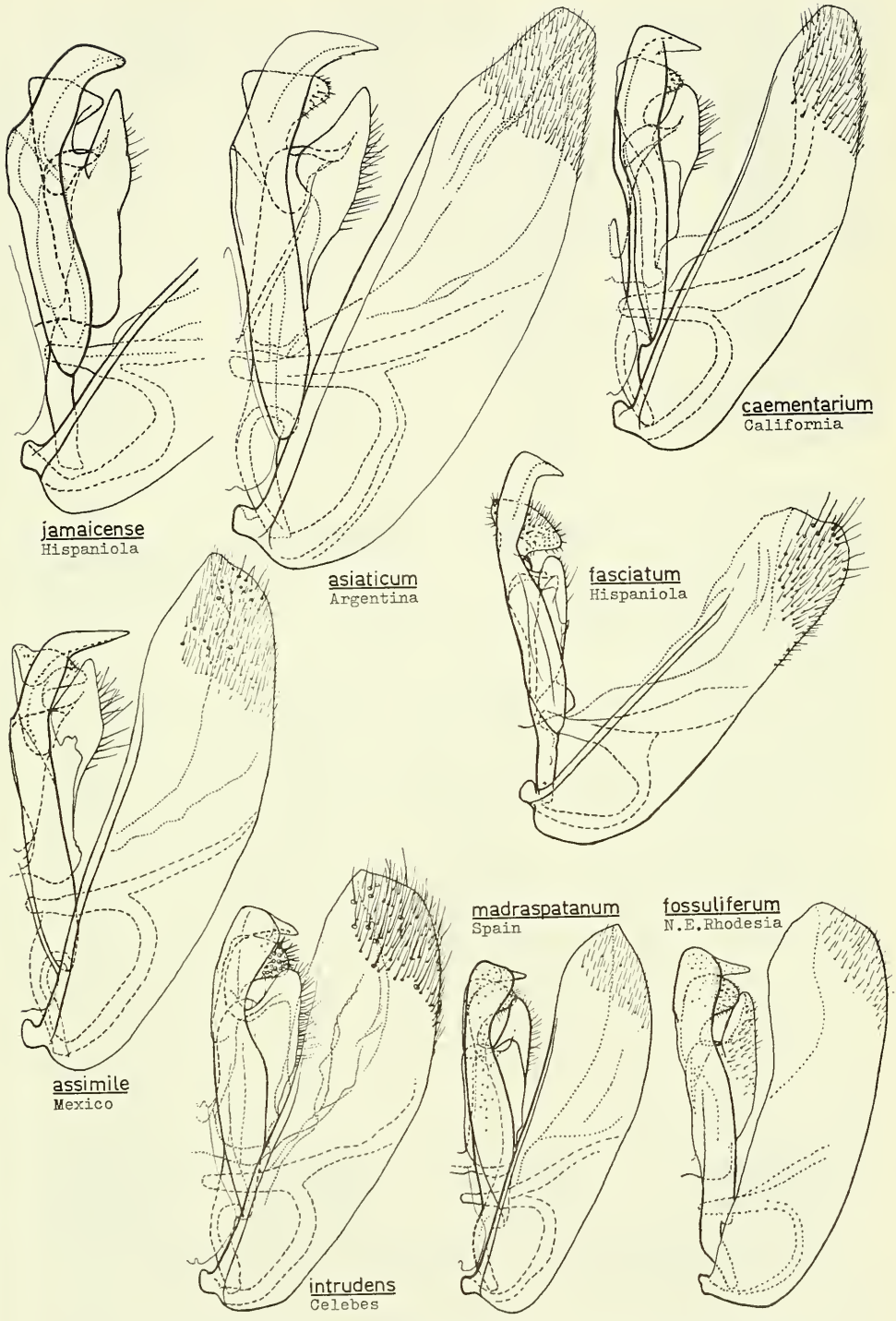

Fig. 6. Dorsal view of male genitalia of species of the *madraspatanum*-group

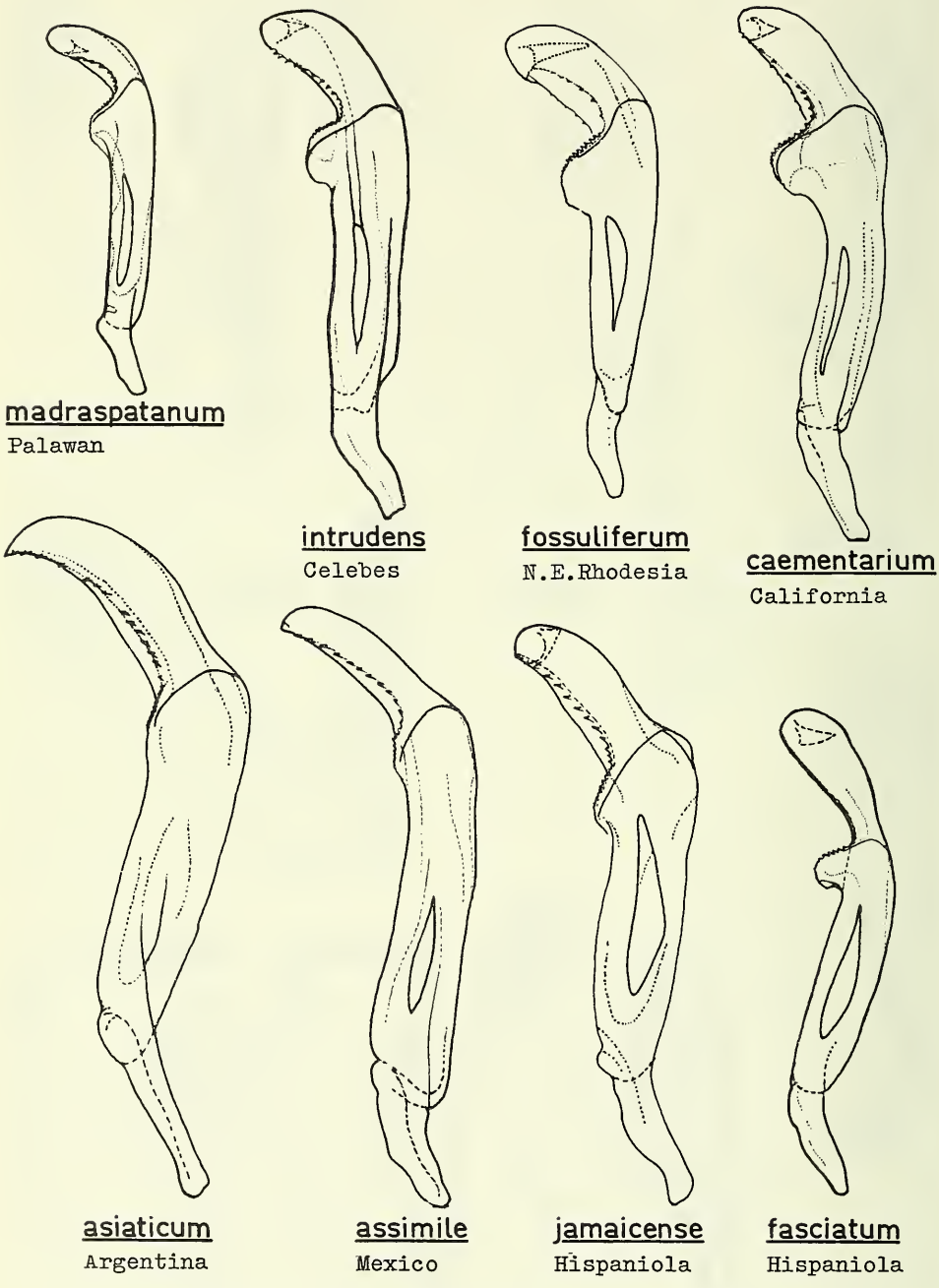

Fig. 7. Inner side of left half of aedeagus of species of the *madraspatanum*-group

13a, b), the latter without a median impression. Sides of pronotum dull, very finely and closely striate, and rather densely punctate. Fore and mid tibiae yellow, the latter with at most a small brownish spot at apex. Body slender; wings with yellowish tinge; pubescence brownish . . . . . *quartinae* (Gribodo)

— Hind coxae, as seen from above, distinctly swollen at base on outer side (Fig. 13e). Pronotal collar short, the anterior face falling more or less steeply away from the dorsal face (Fig. 13d), the latter with a distinct median impression. Sides of propodeum rather shiny, more coarsely and less closely striate, and with fewer punctures. Mid tibiae at least with brown or black mark on apical fourth, in certain forms fore and mid tibiae mainly or entirely black. Body stouter; wings hyaline to pale brownish; pubescence as a rule mainly black . . . . . *fossuliferum* (Gribodo) (= *quartinae* auctt.)

5. Tegulae black. Legs black, with or without a yellow streak on the fore tibiae. Anterior portion of clypeus of ♂ short, its anterior margin truncate or very shallowly emarginate in the middle (Fig. 18) 6

— Tegulae yellow. Legs with extensive yellow markings. Anterior margin of clypeus of ♂ more or less distinctly bilobate (Fig. 15, 18) 7

6. Antennae rather stout; scape strongly swollen (Fig. 18). Lower part of yellow area of mesepisternum as seen from behind, regularly and moderately convex. Transverse striae of propodeum regular and sharply defined, the interspaces smooth and shiny, not distinctly punctate; near the base the striae straight or only slightly arcuate. Yellow band of pronotum well developed, only narrowly interrupted in the middle. Fore tibiae of ♂ black or with small yellow spot at the base. — Hispaniola; Guadeloupe . . . . . *fasciatum* (Lepeletier)

— Antennae normal (Fig. 18). Lower part of yellow area of mesepisternum, as seen from behind, slightly bulging and prominent. Transverse striae of propodeum irregular and somewhat farther apart, the interspaces superficially and rugosely punctate; near the base the striae distinctly arcuate. Yellow band of pronotum sometimes rather widely interrupted in the middle and abbreviated laterally. Fore tibiae of ♂ with yellow stripe (?always). — Cuba . . . . . *argentifrons* (Cresson)

7. Pronotum on each side with yellow spot beneath the dorsal yellow band (reduced or absent in some specimens from the Bahamas). Second and third antennal segments more or less extensively marked with yellowish-brown. Hind trochanter yellow. Gastral tergites with yellow or testaceous band at apical margin 8

— Sides of pronotum black. At least the third antennal segment black. First gastral tergite usually more or less yellow, the following segments black 9

8. Apical bands of gastral tergites broad, brownish-yellow. Trochanter of fore and mid legs yellow. Femora entirely yellow. Gastral petiole yellow to reddish. — Lower California; ?N.W. Mexico . . . . . *jamaicense lucae* (Saussure)

— Apical bands of gastral tergites narrow. Trochanter of fore and mid legs black. Gastral petiole black with yellow line on ventral side. — Cuba; Jamaica; Hispaniola; Bahamas . . . . . *jamaicense jamaicense* (Fabricius)

9. Hind tibiae with broad yellow ring at base; hind tarsi partly yellow. Clypeus of ♂ rather broadly, but very shallowly emarginate anteriorly (Fig. 15). Propodeum in the forms with black petiole as a rule without yellow spots at the base. — North America; Lesser Antilles; accidentally introduced into many islands in the Pacific Ocean, and into Madeira, Japan, and perhaps Peru . . . *caementarium* (Drury)

— Hind tibiae entirely black, or with yellow spot or line of variable size on inner side at base, the basal part at least with a dark line on outer side. Anterior margin of clypeus of ♂ different 10

10. Clypeus of ♂ with two small and narrow lobes, the incision between these lobes shallow, from 4 to 7% of the interocular distance at the clypeus (Fig. 15). Hind tibiae usually with yellow streak on inner side of basal third to half, in the ♀ often less pronounced than in the ♂. Propodeum on each side with basal yellow spot. Genitalia of ♂: Fig. 5—6. — Central America, from Mexico to Costa Rica; Texas; ?Panama; Cuba; Jamaica . . . . . *assimile* (Dahlbom)

— Clypeus of ♂ variable, the teeth lobe-like or more or less sharply pointed, but the incision between them always deeper than in *assimile* (from 8 to 22% of the interocular distance at the clypeus). Yellow streak on inner side of hind tibiae often small or absent. Genitalia of ♂: Fig. 5—6. — South America, also in Panama . . . . . *asiaticum* (L.) (= *figulum* Dahlb.)

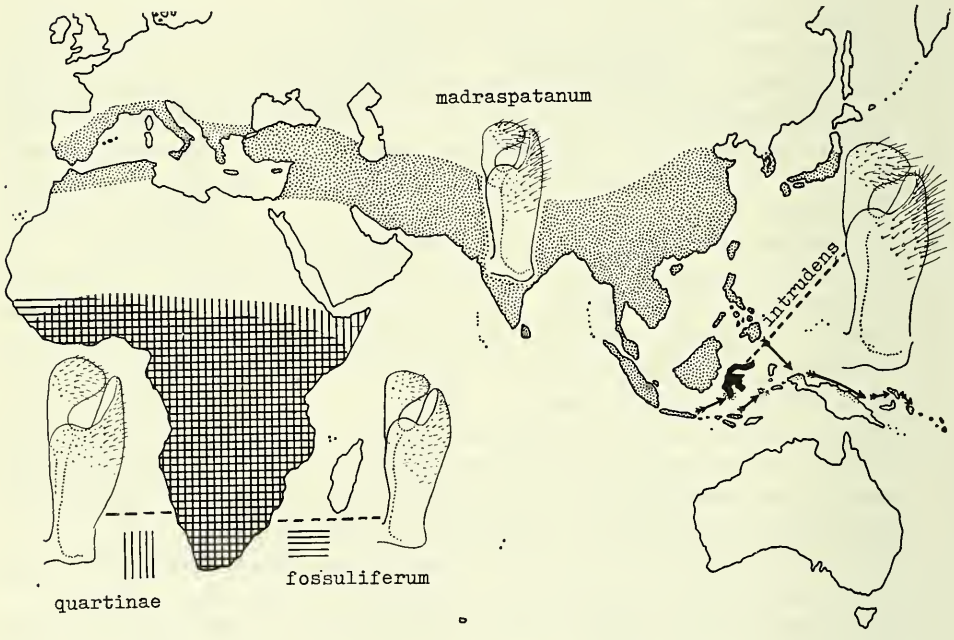

Fig. 8. Approximate distribution of the *madraspatanum*-group in the Old World, with figures of the volsella of each species (cf. Fig. 14)

1. Old World species

In the Old World this group is represented by four closely related species (Fig. 8), viz. one species which is distributed from the Mediterranean area to New Guinea, one which is restricted to Celebes, and two inhabitants of Africa south of the Sahara.

Sceliphron (Sceliphron) madraspatanum (Fabricius) (Fig. 3—12)

In his monograph Kohl (1918) treated the Palaearctic *Sc. tubifex* (Latreille) and the Oriental *Sc. madraspatanum* (Fabricius) as different species, although he said to be convinced that the two forms are not specifically distinct. As we have not found any valid reasons for maintaining this separation, *Sc. tubifex* is here regarded as a subspecies of the widely distributed and variable *Sc. madraspatanum*.

The variability is particularly expressed in the extent of the yellow markings. The darkest form is the "variety *andamanica* Kohl" (Fig. 10), occurring in the Andaman and Nicobar Islands; the most extensive yellow markings are shown by populations inhabiting the extreme western part of the Oriental region (subsp. *pictum* Smith, Fig. 10). In other parts of the extensive range various intermediate patterns can be observed. In some areas (or localities) the pattern is fairly homogeneous, in others specimens belonging to a single population may be found to vary between rather wide limits.

A satisfactory description of the variation of the species throughout its range is therefore by no means a simple matter.

After a detailed study of the available material we have come to the conclusion that it is possible to distinguish a number of more or less clearly defined subspecies. With a single exception, all of these have in the past been described as different species, subspecies or varieties, so that names for them are available. The typical patterns of these subspecies are shown in Fig. 10. It may be noted that in some cases the patterns of populations living in widely separated parts of the range are extremely similar (*tubifex* and *conspicillatum*, *kohli* and *sutteri*). The areas inhabited by the subspecies vary considerably in size and cannot be defined exactly. Partly this is because material from critical localities (or areas) is lacking, but even more important is the fact that the data give strong indications for the existence of a broad zone of intergradation wherever two subspecies are not separated by an important barrier (Fig. 9).

The presence of populations which are transitional between neighbouring subspecies, as well as the frequent occurrence of aberrant specimens of some of the subspecies, make it impossible to construct a key which would cover all the variations of the colour pattern occurring in nature. We have therefore restricted the following key to the typical patterns of the forms recognized here as subspecies. It should be stated expressly that the main purpose of this key is the arrangement of the more important differences between these forms in a convenient manner.

Key to the subspecies of *Sceliphron madraspatanum* (Fabr.) (compare Fig. 10—12)

1. Mesepisternum black, sometimes with more or less reduced yellow mark below the tegulae. Scutellum and propodeum typically without yellow markings 2
— Mesepisternum with yellow mark below the tegulae 3
2. Pronotum with narrowly interrupted yellow band; postscutellum with yellow band. — Southern India and Ceylon to Indonesia . . . . . *madraspatanum* (Fabr.)
— Pronotum and postscutellum black. — Andaman and Nicobar Islands . . . . . *andamanicum* Kohl
3. Propodeum black 4

— Propodeum typically with yellow markings (sometimes more or less reduced, or absent) 5

4. Inhabitants of Japan and China (southward to Indo-China). Scutellum as a rule black. Second segment of hind tarsi often yellowish or brownish . *kohli* Sickmann

— Inhabitants of Formosa. Scutellum with large yellow spot . . . . . *formosanum* van der Vecht, subsp. n.

— Inhabitants of Sumba (and neighbouring Lesser Sunda Islands). Scutellum black or with small yellow spot. Second segment of hind tarsi black . *sutteri* van der Vecht

5. Dorsum of propodeum with large yellow marks, confluent with large yellow mark on declivity. — Turkmenia to West Pakistan . . . . . *pictum* Smith

— Yellow spots on dorsum of propodeum, if present, separated from the spots on the declivity 6

6. Scape of antennae brownish to black. Pronotum without yellow spot on each side below the yellow band. Striation on sides of propodeum anteriorly almost reaching the groove between propodeum and metapleuron; the striae often almost horizontal. — Mediterranean area . . . . . *tubifex* Latreille

— Scape of antennae more or less yellowish beneath (anteriorly). Pronotum sometimes with yellow spot on each side below the yellow band. Close to the groove between propodeum and metapleuron the striation is almost obsolete, the anterior margin of the sides of the propodeum being smooth and shiny; the striae distinctly oblique. Puncturation of mesepisternum slightly finer and sparser than in *tubifex*. — Philippine Islands; New Guinea to Solomon Islands . . . . *conspicillatum* (Costa)

Sceliphron madraspatanum tubifex (Latreille)

Sphex spirifex Linné, var. β; Rossi, 1790, Fauna Etrusca 2: 61, Pl. 2 F. 13 — Tuscany, Italy.

Pelopoeus tubifex Latreille, 1809, Gen. Crust. et Insect. 4: 61 — no locality given; based on Rossi's figure and on material received from M. Spinola.

Pelopoeus pectoralis Dahlbom, 1845, Hym. Eur. 1: 434 — "Europ. merid., Dufour, v. Heyden" (type from St. Sever, South France, in Mus. Lund).

Pelopoeus transcaspicus Radoszkowski, 1886, Hor. Soc. ent. Ross. 20: 24 — "Askhabad ou ses environs" (Mus. Krakow).

Sceliphron tubifex; Kohl, 1918, Annln naturh. Mus. Wien 32: 103 (p.p.).

Sceliphron madraspatanum tubifex; Gussakovskij, 1938, Ark. Zool. 30 (15): 4 ("die westasiatische und mediterrane Subspecies").

This form is widely distributed in the Mediterranean area, but in most places — or perhaps everywhere — it is less common than *Sc. destillatorium* and *Sc. spirifex*. The range as shown in Fig. 9 is mainly based on the records published by de Beaumont, Giner Mari, Grandi, Kohl, Morice, Pulawski and others; it is noteworthy that we have not found the species recorded from the Balearic Islands, Corsica, Sardinia, Malta, Rhodes, Libya, and Egypt.

The eastern limit of the range is uncertain, as we have seen only few specimens from Southwest Asia. If we have correctly placed *Sc. transcaspicum* (Rad.) in the synonymy of *Sc. tubifex*, this subspecies will probably meet *Sc. madraspatanum pictum* at approximately 60° E.

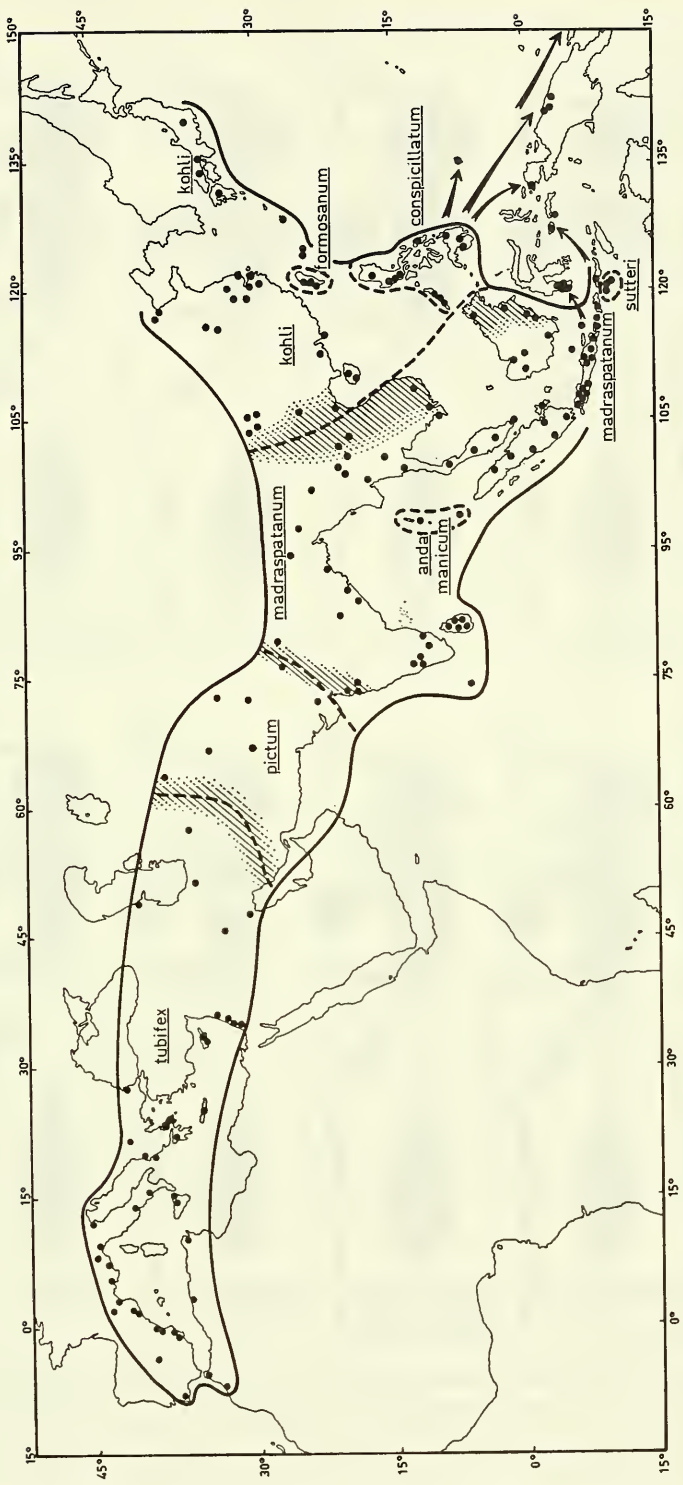

Fig. 9. Approximate distribution of the subspecies of *Sc. madraspatanum* (F.)

Fig. 10. Colour pattern (black, with yellow markings) of the subspecies of *Sc. madraspatanum* (F.); mesepisternum drawn separately

Sceliphron madraspatanum pictum (Smith)

Pelopoeus pictus Smith, 1856, Cat. Hym. Brit. Mus. 4: 231, ♂ — "India", coll. W. W. Saunders (OUM).

?*Sceliphron pictum*; Turner, 1917, Mem. Dept. Agric., Ent. Series 5 (4): 176 [*Sc. pictum* sensu Turner is possibly not the same as *Sc. pictum* (Smith)].

Turkmenia: 4 ♀ "Tschardschui" (Chardzhou or Tshardshou), G. von Rennenkampf (ML).

Iran: 1 ♀ "Persia, Bushire" (= Bushehr) (ETHZ). — Very similar to Fig. 10, no. 2, but the median black mark on the propodeum pin-shaped, consisting of a narrow line which is abruptly dilated into a small spot at the anterior margin.

Afghanistan: 2 ♂ "Afghanistan", Galatea (UZMC).

India or Pakistan: 2 ♂ with label "Ind." (OUM, coll. Saunders; syntypes).

West Pakistan: Peshawar Distr., 1 ♀ Taru, 16—29 May 1915, Fletcher coll. (BM); 1 ♀ 1 ♂ Lahore, April 1909, C. R. D. (BM, no. 1915-323); Quetta, 1 ♀ June 1902, 1 ♂ July 1902, 3 ♀ 3 ♂ Aug. 1902, leg. C. G. Nurse (BM); Karachi, 1 ♂ Manora, May 1899, F. W. Townsend (BM, no. 99-326), 5 ♀ April 1925 (MBUD; ML; NMW); 3 ♀ 3 ♂ "Kurrachee" (Karachi or Kurragee?), Aug.-Sept., Maindron (MP).

India: Bombay Prov., Deesa, 1 ♀ 3 ♂ June 1897, C. G. Nurse (BM), 1 ♀ June 1898, ex coll. Cameron (from Nurse) (BM; spots at base of propodeum lacking). — Punjab, 1 ♂ Ferozepore, July 1897, C. G. Nurse (BM). — "Bengal", 1 ♂ Pusa, June, 1909, CRD (BM).

Arabia: 2 ♀ 1 ♂ Muscat, A. S. G. Jayakar (BM, no. 99-73), 1 ♀ "Mascate", Sept.-Oct., Maindron (MP), 1 ♀ Oman, Ras-al-Khaima, 16 May 1949, G. V. Popov (BM).

Very probably 3 ♂ from "Calcutta" (IRSNB) are incorrectly labelled, for other specimens from this locality are much less marked with yellow.

Sceliphron madraspatanum kohli Sickmann

Sceliphron (*Pelopoeus*) *kohli* Sickmann, 1894, Zool. Jahrb. Syst. 8: 218, ♀ ♂ — "Tientsin" (1 ♀ 1 ♂ marked "type" by Kohl in Mus. Wien).

Sceliphron madraspatanum kohli; Gussakovskij, 1938, Ark. Zool. 30A (15): 4 (3 ♀ Kiangsu; *kohli* is the East-Asiatic subspecies of *Sc. madraspatanum*). — Yasumatsu, 1942, Mushi 14: 106 (Peking).

The East-Asiatic subspecies of *Sc. madraspatanum*, first recognized as such by Gussakovskij in 1938, appears to differ constantly from the nominate subspecies in the presence of a yellow line on the mesepisternum. The antennal scape is black, more or less distinctly yellowish beneath at apex. Scutellum rarely with yellow spot. The two subspecies meet in the Indo-Chinese peninsula, where further investigations will probably demonstrate the existence of a broad zone of intergradation.

Many specimens from the mountainous areas in the province of Szechwan (from 3000—8000 ft.) are rather strongly melanistic. The yellow markings on the antennal scape, the mesepisternum and the hind femora tend to disappear, the gastral petiole and the hind trochanters vary from partly to entirely black.

China: 2 ♀ "China", coll. Drewsen (UZMC). — Hopei, 1 ♂ Peiping, Aug. 1930, G. Lui (MCZ); 1 ♀ 1 ♂ Tientsin (NMW; "*Sc. kohlii* det. Sickmann, Type" in Kohl's handwriting); 2 ♀ Tientsin, one 25 May 1906, F. M. Thomson (BM, nos. 1904-229 and 1907-200); 2 ♀ Hsikou near Tientsin, 17 June 1906, F. M. Thomson (BM, no. 1907-200). — Honan, 1 ♀ Shanckow, Dr. Rennart (IRSNB). — Szechwan, 2 ♀ 4 ♂ Kuanshien, 3000 ft., 5 April—8 May 1930; 3 ♀ 1 ♂ Yachow, 2000—5000 ft., Aug. 1923, Sept. 1928, June 1929; 2 ♂ Yachow-Suifu, May-July 1930; 1 ♀ between Ta Tsien Lu and Yachow, 8000 ft., Aug. 1923 (scutellum with yellow spot); 11 ♀ 1 ♂ Suifu, 1000—1500 ft., 24 May—23 Oct. 1928 and July-Aug. 1929 (only 3 ♀ 1 ♂

with black mesepisternum); 1 ♀ between Yachow [Yaan] and Ning Yuen Fu, July 1928 (mesepisternum and petiole black); 1 ♀ 3 ♂ Suifu-Hong Ya, 1000—1400 ft., June 1929; 1 ♂ Hong Ya, 1800 ft., July 1928 (mesepisternum, hind trochanters and petiole black); 13 ♀ 4 ♂ Fulin [Hanyuan], 3000—7000 ft., July and Aug. 1928 (mesepisternum black in 9 ♀ 4 ♂); 1 ♀ Da Shiang, Lin Pass, 5000 ft., Aug. 1930; 2 ♀ between Fu Yao Lin Pass and Da Shiang Lin Pass, 5000 ft. and 8000 ft., Aug. 1923 (mesepisternum black; petiole partly or entirely black); 1 ♀ between Li To and Lu Ding Chiao, 4000—9000 ft., Aug. 1930; 1 ♀ Lu Ding Chao, 5000 ft., Aug. 1923, 1 ♀ do., 4000—9000 ft., July 1930; 1 ♀ Ning Yuen Fu, 6000—6200 ft., Aug. 1928 (thorax black except for yellow marks on tegulae and postscutellum; petiole black; hind trochanters black with narrow yellow ring at apex); 2 ♀ Yao Gi, 4000—8000 ft., July 1929 (all leg. D. C. Graham, USNM); 2 ♀ Kingfoo Shan, Aug.-Sept. 1932, G. Liu (MCZ); 2 ♂ Chang-Tau-Ching, 800—1000 ft., 18 July 1948, Gressitt and Djou (CAS). — Kweichow, 2 ♀ "Kouy Tcheou, région de Pin-Fa" (= Pingpa) and "environs de Kouy-Yang" (= Kweiyang) (MP). — Kiangsu, 2 ♀ "prov. Kiangsu", Kolthoff (NRS), 4 ♂ Nanking, 24 June 1923, E. C. Van Dyke (CAS); 1 ♀ 1 ♂ Chinkiang, 10 June and 19 July 1924, J. F. Illingworth (BISH); specimens from Shanghai and Zo-sè, leg. O. Piel (MP); 1 ♀ Shanghai, Walker coll. (BM, no. 92-196); 1 ♀ Shanghai (MBUD). — Chekiang, 1 ♀ Hangchow, July 1924, J. F. Illingworth (BISH); 1 ♀ 4 ♂ do., June-Aug. 1926, H. A. Jaynes, T. P. Chiao and J. T. Chu (1 ♂ with yellow spot on scutellum) (USNM); 2 ♀ Ningpo, Aug. 1949, ex Mus. Fribourg (NMB); 1 ♀ Ningpo, leg. Felder (ML). — Fukien, 1 ♀ Foochow, C. B. Rickett (BM, no. 1901-310); 1 ♂ do., S. F. Light (CAS); 1 ♀ 2 ♂ do., June 1935—June 1936, M. S. Yang (BM); 1 ♀ 1 ♂ do., C. R. Kellogg (USNM); 1 ♂ do., Oct. 1923 (scutellum with yellow spot) (USNM); 2 ♀ Futsing, Aug. 1938, H. Caldwell (AMNH); 3 ♀ Yenping (= Nanping), Spring 1915, 3 Aug. 1917, 10 June 1920 (AMNH); 2 ♀ Amoy, leg. Budding (ML); 1 ♂ Amoy, Galatea (UZMC). — Kwangtung, 1 ♀ Liu Ping, 1 ♀ Lung Fao Shan, 1 ♀ 1 ♂ Canton, leg. Mell (ZMB); 3 ♀ Mei-hsien, 8 June 1936 (MCZ). — Hainan I., 2 ♂ Ta Hian, 1 ♂ Ta Hau, June-July 1935, 1 ♀ 1 ♂ Nodoa, 1 ♀ Dome Mt., 13 July 1935, all L. Gressitt (MCZ). — Hongkong, 1 ♂ Hongkong, Galatea (UZMC).

Vietnam (see also p. 207): 1 ♀ Hanoi, 17 Aug. 1917, R. V. de Salvaza (BM); 1 ♀ "Annam, Ten Sin", Nov. 1916, R. V. de Salvaza (BM); 4 ♀ 7 ♂ Hanoi, April-May 1917, V. Demange (MCZ).

Japan: 1 ♀ 1 ♂ "Japan", von Siebold (ML; in ♀ propodeum with basal spots, in ♂ scutellum with small spot, divided by median black line). — Honshû, 3 ♀ 3 ♂ Hyogo, ex coll. Smith (BM); 1 ♂ Kyoto, 15 Aug. 1954, P. H. Arnaud (MCZ); 1 ♂ Saijo, leg. Harima (CAS); 1 ♂ Yokohama (MBUD). — Kyûshû, 1 ♀ Nagasaki, coll. Drewsen (UZMC); 1 ♀ Nagasaki, Xántus (MBUD). — According to information received from Prof. K. Iwata the species inhabits Honshû, Shikoku and Kyûshû, but is lacking in Hokkaido. Prof. K. Tsuneki recently wrote us that about twenty years ago this species did not occur east of Lake Biwa, but that it has recently spread in northern direction and is now common in the province of Kanto.

Ryukyu Is.: Okinawa, 1 ♂ "Okinawa", C. T. Parsons (MCZ); 1 ♀ Iwa, F. G. Werner (MCZ), 2 ♂ Iwa, C. T. Parsons (MCZ); 1 ♀ Motobu Peninsula, Yaetake, 8 Nov. 1945 (UMMZ); 1 ♂ Chizuka, G. E. Bohart & C. L. Harnage (CAS). — Miyako, 1 ♀ 2 July 1932, L. Gressitt (MCZ). — Ishigaki, 1 ♀ 10 May, J. C. Thompson (CAS). — Iriomote, 2 ♀ 1 ♂ 22 Aug. 1934, L. Gressitt (MCZ; ♂ with yellow spot on scutellum).

Sceliphron madraspatanum formosanum van der Vecht, subsp. nov.

♀ ♂ — Very similar to subsp. *kohli*, but the scutellum with large yellow spot. The pattern is shown in Fig. 10.

Formosa: 1 ♀ Kagi, 21 Aug. 1907, H. Sauter (ML; bought 6 July 1908, type); the following specimens are paratypes: 1 ♀ Takao, 1907; 2 ♂ Kagi, 21 Aug. 1907, 2 ♂ Koroton, 1—15 Sept. 1907, all leg. H. Sauter (ML; bought 6 July 1908; in one ♂ the propodeum has small basal spots); 3 ♂ Kagi, 26 Aug. 1907, H. Sauter (BM, no. 1919-234); 12 ♀ 14 ♂ Takao, Taihanroku, Tainan, and Kagu, 1907-09, H. Sauter (MBUD; propodeum in 4 ♀ with traces of yellow spots, in one ♀ with three pairs of spots as in fig. 12, no. 2 of bottom row); 6 ♀ 2 ♂ "Formosa", H. Sauter (AMNH); Taipei, 1 ♀ 13 July 1956, 1 ♀ 30 May 1958, 1 ♂ 12 June 1958, all K. S. Lin (BISH); 1 ♀ Puli (Hori), July 1954 (BISH); 1 ♀ Taihanroku, H. Sauter (CU).

Sceliphron madraspatanum madraspatanum (Fabricius)

Sphex madraspatana Fabricius, 1781, Spec. Insect. 1: 445 — "Malabar", coll. Banks (BM).

Sphex maderospatana (!); Gmelin, 1790, in Linné, Syst. Naturae (ed. 13) 1 (5): 2727.[1])

?*Sphex lugubris* Christ., 1791, Naturgesch. Ins. etc. Frankfurt: 306, Pl. 30 Fig. 5 — "St. Domingo" [invalid homonym of *Sphex lugubris* Villers, 1789][2]). — Dalla Torre, 1897, Cat. Hym. 8 : 379 (in synonymy of *Sceliphron caementarium* (Drury)), 387 (*Sceliphron lugubre* Christ). — Schulz, 1903, Sitz. Ber. Akad. München, math.-phys. Kl. 1903: 470 (unidentified species, perhaps a var. of *Sc. caementarium*) [overlooked by Kohl, 1918].

Pelopoeus interruptus Palisot-Beauvais, 1805, Ins. rec. en Afr. et Amer., Hym.: 50, Pl. 7 Fig. 5 — from unknown locality, probably in Asia. — Schulz, 1906, Spolia Hym.: 192 (synonym of *Sceliphron "maderospatanum"* (Fabr.)).

Pelopoeus bilineatus Smith, 1852, Ann. Mag. nat. Hist. (2) 9: 47, ♀ — "Bombay", leg. E. T. Downes (BM, no. 21.608).

Pelopoeus separatus Smith, 1852, Ann. Mag. nat. Hist. (2) 9: 47, [♀ !] — "Bombay", leg. E. T. Downes (BM, no. 21.609).

Sceliphron madraspatanum; Turner, 1917, Mem. Dept. Agric., Ent. Series 5 (4): 176 (p.p.; excl. *kohli* and *bilineatus*).

Sceliphron (*Pelopoeus*) *madraspatanum*; Kohl, 1918, Annln naturh. Mus. Wien 32: 109 [in part].

Tibet: 1 ♂ Jarkalo (MBUD).

India: 3 ♀ "India" (OUM). — Western India: 1 ♀ Bombay, Capt. Downes (BM; type of *Pelopoeus bilineatus* Smith, no. 21.608; in addition to the normal pattern: mesepisternum with yellow stripe, propodeum with two lines on posterior two-thirds of dorsum, and a small spot on the declivity); 1 ♀ Bombay, Capt. Downes (BM; type of *Pelopoeus separatus* Smith, no. 21.609; mesepisternum and propodeum black); 2 ♀ Bombay, 30 Sept. 1928 (MBUD; one with minute mark on mesepisternum, the other moreover with small spots on scutellum and propodeum); 1 ♀ Bandra, Dr. Jayakar (BM, no. 1905-152); Poona, 1 ♀ 1 ♂ Western Ghats, Sept. 1962, F. L. Wain (ML). — Southern India: 3 ♀ Malabaria, coll. Colsm. (UZMC); 1 ♀ 1 ♂ Tranquebar, coll. Westermann (UZMC). Mysore, 1 ♀ Shimoga, R. Tunga, 1865 ft. (MCZ). Kerala, 1 ♀ Walayar Forests, Sept. 1951, P. Susai Nathan (KVK), 1 ♀ 2 ♂ do., 700 ft., Oct. 1959 and Oct. 1962, P. Susai Nathan (ML; 1 ♂ with minute spot under tegula). Madras State, 1 ♀ Nilgiri Hills, Singara, 3400 ft., May 1948, P. Susai Nathan (MCZ), 1 ♀ Coimbatore, July 1923 (MCZ), 1 ♂ do., 17 July 1934 (BM), 1 ♀ do, 15 Febr. 1939 (MR), 9 ♀ 2 ♂ do., 1400 ft., July 1955, Aug. and Oct. 1959, May-Nov. 1960, P. Susai Nathan (ML; 1 ♀ with yellow mark on mesepisternum and small spot on scutellum, 1 ♂ with minute spot under tegula), 1 ♀ do., Sept. 1961, P. Susai Nathan (LAM); 2 ♂ Tanjore (= Thanjavur), Nedungadu, 26—27 April 1938, P. Susai Nathan (MR). Karikal Terr., 5 ♀ Kurumbagaram, P. Susai Nathan (MCZ), 1 ♀ do., April 1951, P. Susai Nathan (KVK), 17 ♀ 14 ♂ Pondichery, April 1962, P. Susai Nathan (ML; a few specimens with minute spots on mesepisternum and scutellum, in one ♀ propodeum with very small basal and apical spots). — Central India: Madhya Pradesh, 1 ♀ 1 ♂ Raipur, 18—27 Aug. 1962, F. L. Wain (ML; ♀ with traces of yellow spot on scutellum); Andra Pradesh, 2 ♀ Vizagapatam, Dec. 1926, leg. Fraser (BM). — Kashmir: 1 ♀ Murree-Kashmir Road, 4000 ft., June 1901, C. G. Nurse (BM); 1 ♂ Kangra Valley, 4500 ft., June 1899, leg. Dudgeon (BM, no. 1904-35). — Sikkim: 1 ♀ Sikkim, F. A. Möller (UZMC), 1 ♂ do., 1800 ft., July 1897, leg. Dudgeon (BM; small spot on mesepisternum), 1 ♀ do., coll. Bingham (BM, no. 1902-120; mesepisternum with two small spots). — Bengal: 2 ♀ 1 ♂ Bengal, coll. Drewsen (UZMC); 1 ♂ Calcutta, coll. Rothney, from F. Smith (ML; mesepisternum with small spot), 6 ♀ 5 ♂ do., Oct. 1908—July 1909, E. Brunetti (BM), 1 ♀ 1 ♂ do., 1961, Dr. H. Spurway (ML; ♂ with reduced spots on mesepisternum and scutellum); series from Barrackpore, coll. Rothney (OUM; a few females with small yellow spots on mesepisternum and scutellum). — Assam, 1 ♂ "Assam", from Westwood (ML).

Ceylon: 2 ♀ "Ceylon", coll. Drewsen (UZMC); 8 ♀ 16 ♂ from eleven localities throughout the island, 1953-4, F. Keiser (NMB; ML; in a few males gastral petiole more or less blackened at

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[1]) This spelling is erroneously ascribed to Fabricius, 1781, in Kohl's list of references (1918: 109).

[2]) Very probably the locality is erroneous, for the description applies much better to typical *Sc. madraspatanum* than to any of the American species.

Fig. 11. Variation of the nominate subspecies of *Sc. madraspatanum* (F.) throughout its range

apex, one of these males is strongly melanistic: pronotum almost entirely black, hind trochanters with black blotch on inner side, hind femora with only a narrow yellow ring at the base).

Maldive Is.: 2 ♀ 1 ♂ Addu Atoll, 22 Aug.—28 Oct. 1958, W. W. A. Phillips (BM).

Burma: 3 ♀ Myitkyina, 20 May 1945, W. Miller (KU). — Tenasserim, 1 ♂ Salween Valley, 7-90, coll. Bingham (BM); 1 ♀ Pegu, D., coll. Bingham, 96-30 (BM); 1 ♀ Tavoy, 2 Oct. 1893, coll. Bingham, 96-30 (BM); 1 ♀ Thaungyin, Febr. 1891, 1 ♂ Mergui, Nov. 1889 (OUM).

Thailand: 1 ♀ Nan, Dec. 1931, T. D. A. Cockerell (AMNH); 4 ♀ 2 ♂ Chiang Mai prov.: Chiang-dao, 450 m, April 1958, T. C. Maa (BISH; in one specimen postscutellum black); 1 ♀ Blangkassi, km 208, R. van der Veen, Oct.-Nov. 1943 (ML; pronotum black; yellow mark on postscutellum slightly smaller than usual, yellow ring on hind tibia covers basal half on inner side, but less than basal fourth on outer side; yellow part of hind basitarsus small); 1 ♀ Bangkok, 3 Dec. 1957, J. L. Gressitt (BISH); 1 ♂ do., Febr. 1930, Hugh Smith (small spots on mesepisternum) (USNM); 2 ♂ do., 22 Sept. 1935 (CU; mesepisternum with two small yellow spots); 1 ♀ 1 ♂ Banna, Nakhon, May 1958, T. C. Maa (BISH). — "Peninsular Siam", 1 ♀ Trang, Banchong, 25 April 1924, I. H. N. Evans, 1 ♀ Nakon Sri Tamarat, Ronpibum, 7 April 1922, H. M. Pendlebury (BM).

Laos: 1 ♀ 5 ♂ "Laos" (MBUD); 1 ♀ Luang Prabang, Ban Samang, 20 Nov. 1918, R. V. de Salvaza (BM); 1 ♂ Luang Prabang, Hat Thoun, 10 Nov. 1917, R. V. de Salvaza (BM; thorax black, only tegulae and postscutellum with traces of yellow); 1 ♀ Mouc Dahan, J. F. Godfrey (BM, no. 1920-244, very dark form); 1 ♀ Ha Peng (?Na Peng), 3 Nov. 1919, R. V. de Salvaza (BM; small spots on mesepisternum).

Vietnam: (see also p. 204): 2 ♀ 1 ♂ M'drak, East of Ban Me Thuot, 4—600 m, Aug. and Dec. 1960, C. M. Yoshimoto (BISH; in one ♀ mesepisternum on one side with small yellow spot); 4 ♀ 2 ♂ Tayninh, Nov. 1923, 2 ♀ 1 ♂ Phuquoc Isl., 1924 (IRSNB; mesepisternum with yellow mark, in some specimens reduced; spot on scutellum more or less reduced, absent in one ♀, propodeum in one ♀ with small basal spots; ♂ generally a little darker than ♀).

Cambodia: 1 ♀ Pnom Penh (MP; mesepisternum and scutellum marked with yellow!).

Not located: 1 ♀ Cochinchine, Trian, 7 Oct. 1923, R. Vitalis de Salvaza (KVK).

Malaya: In a series of specimens (BM) from several localities, including Upper Perak, Kuala Kedah, Kuala Langat, Kuala Lumpur, Negri Sembilan, and Singapore, the pattern is usually normal; among 6 ♀ 6 ♂ from Kedah, however, 3 ♀ 2 ♂ have yellow spots on scutellum and mesepisternum, 3 ♀ 4 ♂ have only a more or less reduced spot on mesepisternum, the males are generally slightly darker than the females.

Sumatra: Fairly common throughout the island; we have seen specimens from Deli, Indragiri, Bengkulen, Djambi and Lampong (MZB; ML; band on pronotum rather widely interrupted, absent in 1 ♀ 1 ♂ from South Sumatra; yellow markings on hind tibia and basitarsus more or less reduced, petiole sometimes slightly blackened at apex).

Bangka Is.: 1 ♂ Pangkalmundo, 10 April 1931, J. van der Vecht (ML; similar to the less melanistic Sumatran specimens).

Borneo: 2 ♀ 3 ♂ "Borneo", S. Müller (ML), 1 ♀ "Borneo", Schwaner (ML). — Sarawak, 1 ♀ Nanga Pelagus near Kapit, 180—585 m, Aug. 1958, 1 ♀ Merirai Valley near Kapit, 180 m, July-Aug. 1958, both T. C. Maa (BISH). — Brit. N. Borneo, 2 ♀ West Coast Residency, Ranau, 500 m, Sept.-Oct. 1958, L. W. Quate (BISH; scutellum and mesepisternum with yellow mark, band on pronotum only slightly interrupted); series from Bettotan and Kudat, July-Sept 1927, Boden Kloss & Pendlebury (BM; 2 ♀ 2 ♂ ML; partly with yellow markings on scutellum and mesepisternum, but yellow parts of legs often somewhat reduced). — West Borneo: 1 ♂ Marbau Tjondong, 1923 (MZB); 1 ♂ Bengkajang at Ledo River, July 1933, H. R. A. Muller (ML; petiole black above, yellow on hind legs much reduced); 1 ♂ Sintang, 1910 (ZMB). — East Borneo: 1 ♀ Samarinda, Muara Kaman, Nov. 1950, 1 ♀ 2 ♂ Balikpapan, Wain and Mentawir Rivers, Oct.-Nov. 1950, 1 ♀ 2 ♂ Tabang, Bengen River, Aug. 1956, 2 ♀ Kembang Djangut, July 1956, all leg. A. M. R. Wegner (ML); 1 ♂ Kariorang, April 1937, Mrs. M. E. Walsh (BM); series from several localities, leg. A. M. R. Wegner, in MZB.

The pattern of the Bornean populations shows a high degree of variability. Whereas there is on one hand a tendency towards development of yellow markings on scutellum and mesepisternum, certain other parts of the body, particularly the petiole and the hind legs, are often subject to strong melanization.

Some data on the material in the Leiden Museum (10 ♀ 13 ♂): scutellum with small spot in 1 ♀

"Borneo", with medium to large spot in 2 ♀ 2 ♂ N. Borneo and 4 ♂ E. Borneo (two females with large spot were among the series from E. Borneo in MZB); mesepisternum with yellow stripe in 2 ♀ 2 ♂ N. Borneo, with reduced stripe in 2 ♀ E. Borneo; hind trochanters partly black in 3 ♀ 4 ♂ E. Borneo, 1 ♂ W. Borneo; gastral petiole at least half black in 2 ♂ "Borneo", 1 ♂ W. Borneo and 3 ♀ 5 ♂ E. Borneo. Two extreme patterns are shown in Fig. 10.

Java: Common throughout the island, up to about 1400 m above sea level. We have examined 75 ♀ and 72 ♂ from many localities, mainly in West Java. Colour pattern very constant, slightly darker than typical *madraspatanum*; yellow mark on antennal scape sometimes indistinct, yellow band on pronotum always distinctly interrupted, scutellum and mesepisternum always black, gastral petiole usually blackened at extreme apex, rarely more extensively black; hind basitarsus with inconspicuous brownish ring.

Bawean: 1 ♀ leg. Fruhstorfer (ML); 1 ♀ June 1920, H. C. Delsman (MZB).

Kangean Is.: 2 ♀ Ardjasa, Aug. 1954, A. Hoogerwerf (ML).

Bali: 2 ♂ Den Pasar, 1 June 1935, R. Awibowo (ML).

Lombok: 1 ♂ Sapit, 2000 ft., April 1896, H. Fruhstorfer (CU); 1 ♀ "Lombok", Carl Aurivillius (NRS).

The specimens from Bawean, Kangean, Bali and Lombok agree in pattern with those from Java.

Sumbawa: see under subsp. *sutteri*.

Flores: 1 ♀ Boa Wae, 450 m, 2 April 1957, A. M. R. Wegner (ML; mesepisternum with reduced yellow stripe, pronotum, petiole and hind legs as in subsp. *sutteri*); 1 ♀ Rana Mese, 22 Febr. 1927, B. Rensch (ZMB; mesepisternum with small yellow spots).

So long as the populations inhabiting these latter two islands are imperfectly known, it seems best to regard them as transitional between subsp. *madraspatanum* and *sutteri*.

Celebes: South Celebes, 1 ♂ "Celebes", no. 57-101, 1 ♀ "Mak" (= Makassar, leg. A. R. Wallace), 58-142 (BM); 1 ♀ Samanga, Nov. 1895, 2 ♀ Patunuang, Jan. 1896, H. Fruhstorfer (NMW), 1 ♀ Latimodjong Mts., Uru, 800 m, Aug.-Sept. 1930, G. Heinrich (ZMB), 1 ♀ Malino, 4000 ft., Jan. 1936, L. E. Cheesman (BM); 1 ♀ Palopo, Todjambu, July 1936, L. J. Toxopeus (MZB); 1 ♀ Sungguminasa, Aug. 1949, C. J. H. Franssen (ML). — Yellow markings slightly more extensive than in Javan specimens: band on pronotum wide, hardly interrupted in the middle; gastral petiole not blackened at apex; only the basal fourth to third of fore and mid femora black; all basitarsi yellow, black at apex, hind basitarsus also slightly fuscous at base.

In the specimens available for study the pattern appears to be fairly constant, but examination of a more extensive material is desirable.

Buru: 1 ♀ 2 ♂ Balabalu, 6—10 June 1959 (MZB; ML).

Ambon: (Amboina): 1 ♀ "Amb.", leg. Wallace, coll. Saunders (OUM); 1 ♀ Kudamati, 1 ♂ Soja, April 1941, E. Lundquist (MZB); 7 ♀ 4 ♂ Waai, 14—23 July 1959, 3 ♀ do., Dec. 1960, 1 ♀ do., Jan. 1961, 3 ♂ do., Febr. 1964, A. M. R. Wegner (MZB; ML).

The specimens from Buru and Amboina agree in all details with those collected in Java. We regard this as an indication that the species has been introduced into these islands by human agency.

Sceliphron madraspatanum andamanicum (Kohl)

Sceliphron (*Pelopoeus*) *madraspatanum* var. *andamanica* Kohl, 1918, Annln naturh. Mus. Wien 32: 109 — "Andamanen Insel" (ZMB) [*andemanicum* (!) in index, p. 169].

In this subspecies the thorax is black, except for a small yellow spot on the tegulae. This appears to be the usual pattern of the species in the Andaman and Nicobar Islands. Occasionally populations in other localities produce specimens which approach this extreme degree of melanism rather closely. Kohl (1918) recorded a specimen from Borneo which had the thorax black, except for markings on tegulae and postscutellum,

Fig. 12. Variation of some subspecies of *Sc. madraspatanum* (F.)

and the Leiden Museum possesses a similarly coloured specimen from Blangkassi in Thailand.

Andaman Is.: 1 ♂ N. Passago Island, G. Rogers (BM, no. 1906-204).
Nicobar Is.: 3 ♀ 1 ♂ Nicobar Is., leg. Roepstorff (UZMC; 1 ♀ ML).

Sceliphron madraspatanum conspicillatum (Costa)

Pelopoeus conspicillatus Costa, 1864, Ann. Mus. zool. Napoli 2 (1862): 112, ♀ — "Luzon", Philippine Islands (? type in Mus. Naples). — Kohl, 1918: 109 (in synonymy of *Sc. madraspatanum* (Fabr.)).
Sceliphron maderospatanum(!); Williams, 1919, Bull. Hawaii. Sugar Pl. Ass., Ent. Series 14: 123 (bionomics in Luzon).
Sceliphron conspicillatum; Rohwer, 1921, Phil. Jl. Sci. 19: 675 (Luzon; Leyte; Palawan).
Sceliphron madraspatanum; Krombein, 1949, Proc. Hawaii. ent. Soc. 13: 387 (Caroline Is.).

According to the original description the propodeum of the type(s) is entirely black. In several localities in the Philippine islands specimens with this character have been collected together with individuals with one to three pairs of yellow spots on the propodeum. Assuming that the presence of three pairs of spots is the "normal" condition, one may observe that reduction of these spots does not always proceed in the same way. Sometimes all the spots are more or less strongly reduced simultaneously, but usually the spots on the dorsum are the first to disappear and those at the apex the last; we have seen, however, a few specimens with only dorsal and apical spots, and one female with only a pair of dorsal spots. In very brightly coloured specimens the apical spots may become fused, or some additional spots may develop (Fig. 10 and 12).

A dark form occurs in Palawan, where the gastral petiole is as a rule partly or entirely black above, with a more or less distinct yellow line (sometimes lacking) on the under side. Even in such dark specimens the propodeum usually bears at least one or two pairs of yellow spots.

Specimens collected in 1955 and subsequent years in New Guinea (Hollandia and environs) and some neighbouring islands undoubtedly belong to the Philippine subspecies. Since there are no earlier records of *Sc. madraspatanum* from the Papuan area, it is practically certain that they are descendants of wasps accidentally introduced by plane (or, less likely, by boat) from the Philippine Islands during or shortly after the second world war.

Luzon: 4 ♀ 3 ♂ "Luzon" (ZMB; propodeum with 3 pairs of spots in 3 ♀, one pair in 1 ♀ 1 ♂, black in 2 ♂). — Tarlac Prov., 1 ♀ 1 ♂ Luista east of San Miguel, 13 Oct. 1945; Rizal Prov., 2 ♀ 1 ♂ Wackwack, 12—13 Sept. 1945, 1 ♂ Maly, 7 Oct. 1945; Pampanga Prov., 1 ♂ near Santa Cruz, 16 Sept. 1945, all leg. Richard P. Dow (MCZ; in most specimens markings of propodeum more or less reduced, absent in one ♀). — Laguna, Los Baños, 3 ♀ 2 ♂ 1915—1919, Coll. of Agric., C. F. Banks, and F. X. Williams, 1 ♂ do., July 1935, W. F. Jepson (ML; propodeum in 1 ♀ 1 ♂ with three pairs of spots, in the ♂ with additional spots on pronotum and propodeum; in 1 ♀ 1 ♂ with 2 pairs and in 1 ♀ 1 ♂ with apical spots only). — 10 ♀ 17 ♂ from Manila, Antipolo, Montalban, and several other localities, 1952—1954, Miss C. Baltazar and co-workers (BPI; propodeum in 1 ♀ 4 ♂ with 3 spots, in 3 ♂ with 2 spots, in 6 ♀ 2 ♂ with 1 spot, in 3 ♀ 8 ♂ black). — Mountain Province, 1 ♂ Babalasan, Kalinga, 5 March 1953, Marjorie C. Townes (ML; propodeum black, hind trochanter black with narrow apical yellow ring, hind femur black with similar ring at base); 3 ♀ "Fillipinerne", 3500 ft., ca. 1 June 1957, leg. Tage Ellinger (UZMC; 1 ♀ ML; propodeum in 1 ♀ with two small apical spots, in 2 ♀ black). — 1 ♀ Rizal Prov., Novaliches, 8 Dec. 1930 (CU); 1 ♂ Rizal, Theresa, 25 July 1952, H. Townes (coll. Townes; propodeum black); 1 ♀ Bacio (CU; propodeum black); 2 ♂ Los Baños, Sept. 1959, C. M. Yoshi-

moto (BISH; propodeum in 1 ♂ with apical spots only, in 1 ♂ black); 1 ♀ 1 ♂ Manila, Aug.-Sept. 1945, H. E. Milliron (BISH; propodeum black); 1 ♂ Bauang, 2 Oct. 1945, H. E. Milliron (BISH; propodeum black); 1 ♀ Mt. Makiling, F. C. Hadden (CAS), 1 ♂ Laguna, Pangil, May 1931 (CAS; propodeum black); 3 ♂ Alabang, April 1930, J. Valdez (CAS; propodeum in 2 ♂ with 2 pairs of spots, in 1 ♂ black); 2 ♀ do., Oct.-Dec. 1930, G. Merino (USNM); 1 ♀ Lucban, Tayabas, 24 May, R. C. McGregor (USNM).

Samar: 2 ♀ July 1924, Wright (CU; propodeum black), 1 ♀ Malaguinao, 22 April 1952, E. S. Gachalian (BPI; propodeum black).

Mindanao: Davao Prov., 1 ♀ Calian, July, 1 ♀ Lawa, April, C. S. Clagg (MCZ; propodeum with three pairs of spots); 1 ♀ Agusan, Santiago, April 1931 (CU; propodeum with dorsal and apical spots); 1 ♀ 1 ♂ Obrando, 24 Sept. 1919 (lot 500, sub 223) (CU; propodeum in ♀ with dorsal spots and one large apical mark, in ♂ black); 1 ♀ Lagao, 17 Jan. 1954, H. Townes (coll. Townes).

Palawan: 1 ♀ 1 ♂ Babuyan, 1 ♂ Inagawan, 1 ♂ Pt. Princesa, Dec. 1952, H. Townes (coll. Townes; ML; gastral petiole black, propodeum with basal and apical spots); 3 ♀ Brookes Point, Uring Uring and Makagwa, 22 Aug. 1961, Noona Dan Exp. (UZMC; 1 ♀ ML; propodeum with small basal spots and one apical spot in 2 ♀, with only the apical spot in 1 ♀; gastral petiole black with yellow line on under side, in one ♀ also yellow above at base).

West New Guinea: Vogelkop Peninsula, 1 ♂ Sorong, 21 March 1952, L. D. Brongersma (ML); Hollandia, 2 ♀ Jan. 1956, 1 ♀ April 1959, R. T. Simon Thomas, 5 ♀ 2 ♂ Jan. and Febr. 1956—June 1958, G. den Hoed (ML; 1 ♀ 1 ♂ coll. van Lith), 2 ♀ 15 and 16 March 1959, L. D. Brongersma (ML); Ifar, 350 m, 5 ♀ Dec. 1956—March 1959, J. van den Assem (ML), 1 ♀ 450 m, N. of Lake Sentani, Nov. 1955, L. D. Brongersma c.s. (ML). — Pattern fairly constant, except for the propodeum, which varies from black (1 ♀) via one (6 ♀) or two pairs of spots (4 ♀) to three pairs (4 ♀ 1 ♂); one female has only the dorsal spots left, but in the other specimens with only one pair of spots the basal and dorsal spots are lacking.

Territory of New Guinea: 1 ♂ Maprik, 20 Oct. 1957, J. Smart (BM).

Bismarck Arch.: 1 ♀ Manus Island, Lorengau near sea level, 15—25 Dec. 1959, T. C. Maa (BISH; Fig. 12). — New Britain, 2 ♀ Keravat, 17 Nov. 1957, 1 ♀ 3 ♂ Puktas, Baining Mts., 22 Nov. 1957, J. Smart (BM).

Solomon Is.: 1 ♀ Buka Island, 27 Oct. 1960, R. W. Paine (ML; propodeum with three pairs of spots); 1 ♀ Bougainville, Tokinoitu, 20 m, 2 June 1956, J. L. Gressitt (BISH; Fig. 12).

Caroline Is.: common in the Palaus, probably introduced during the war; see Krombein, 1949.

Sceliphron madraspatanum sutteri van der Vecht

Sceliphron madraspatanum sutteri van der Vecht, 1957, Verh. naturf. Ges. Basel 68: 368, ♀ ♂ — "Sumba, Waikarudi" (type ♀, NMB).

This subspecies was described from a series of over 160 specimens from Sumba. Four females from Sumbawa were regarded as paratypes, but only two of these had complete yellow spots on the mesepisternum. It seems possible that examination of more material from this island will show that the population as a whole is intermediate between the subspp. *madraspatanum* and *sutteri*, or even that it is closer to the former.

Sceliphron (Sceliphron) intrudens (Smith)

Pelopoeus intrudens Smith, 1859, J. Proc. Linn. Soc., Zool. 3: 15, ♀ ♂ — "Celebes", leg. Wallace (lectotype ♀, BM).

Sceliphron (*Pelopoeus*) *intrudens*; Kohl, 1918, Annln naturh. Mus. Wien 32: 110.

This species superficially resembles *Sc. javanum*, but it is more closely allied to *Sc. madraspatanum*. In fact, it may be regarded as the modified descendant of a *madraspatanum* ancestor which reached Celebes at an early date.

The female with label "Mak. 58/142" in the British Museum is herewith designated as the lectotype.

Celebes: many specimens with label "Celebes" only (BM, MCG, ML, MP, UZMC). — North Celebes: 2 ♀ "North Celebes" (MZB), 9 ♀ 4 ♂ Minahasa, coll. Gribodo (MCG, 1 ♀ ML). — Central Celebes: 1 ♀ Luwu, Masamba, April 1941, L. Maurenbrecher (MZB); 2 ♀ 2 ♂ Pendolo, Lake Poso, 650 m, Febr. 1950, C. J. H. Franssen (ML); 6 ♀ 1 ♂ Palu, Dec. 1936 (ML), 1 ♀ 2 ♂ Palu (MZB); 1 ♀ Ampana, 30 Sept. 1952 (ML). — South Celebes: 1 ♀ 2 ♂ Sengkang, Sept.-Oct. 1930, J. van der Vecht (ML); 1 ♀ 1 ♂ Pinrang, 29 May 1948, J. van der Vecht (ML); series from Samanga, Nov. 1895, and Patunuang, Jan. 1896, H. Fruhstorfer (NMW; MP; 1 ♀ 1 ♂ IRSNB; 1 ♀ CU); 1 ♀ 2 ♂ Latimodjong Mts., Uru, 800 m, Aug.-Sept. 1930, G. Heinrich (ZMB), 1 ♀ Latimodjong Mts., Bontu-Batu district, 4000 ft., 19—25 May 1931, C. F. Clagg (MCZ); 1 ♀ Bantimurung, 25 May 1930, G. Heinrich (ZMB); 2 ♀ 4 ♂ Bantimurung, June 1948, J. van der Vecht (ML); 1 ♀ Maros, leg. Albrandt (NMW); 1 ♀ 1 ♂ "Mak. 58/142" (= Makassar, leg. Wallace) (BM, incl. the lectotype, ♀); 2 ♂ "Mak." (= Makassar, leg. Wallace) (OUM), 3 ♂ "Makapar" (= Makassar), 23 April and 16—17 May 1906, ex coll. Bingham (ML), 1 ♀ Makassar, Dec. 1908, F. Muir (ML), 2 ♀ Makassar, April 1949, C. J. H. Franssen (ML), 1 ♂ Makassar, T. Barbour (MZC), 1 ♂ Makassar, 1905, from Shelford (BM); 1 ♀ Malino, 4000 ft., Jan. 1936, L. E. Cheesman (BM); 3 ♀ 2 ♂ Lompoh Batang, 200 m, Nov. 1941, H. Lucht (ML); 2 ♀ 1 ♂ Tanete, March 1949, C. J. H. Franssen (ML). — 1 ♀ "Ile Moena, Raha" (IRSNB). — 1 ♂ Kalao Is., 12-99, ex coll. Bingham (BM, 1902-120).

Note: "*Sceliphron intrudens*" Bingham, 1897, is evidently *Sc. javanum* (Lep.); "*Sceliphron intrudens* var." Williams, 1919, p. 120, is the Philippine subspecies of *Sc. javanum* (Lep.).

Distribution. — *Sc. intrudens* (Smith) appears to be restricted to Celebes and some of the neighbouring smaller islands.

Sceliphron (Sceliphron) quartinae (Gribodo)

Pelopoeus quartinae Gribodo, 1884, Annali Mus. civ. Stor. nat. Genova (2) 1: 298 — "Scioa, Let-Marefià" (18 ♀ 9 ♂), "Daimbi" (1 ♀) (MCG). — Schulz, 1911, Zool. Ann. Würzburg 4: 159 (additional description of syntypes in Mus. Genova).

Sceliphron fulvohirtum Arnold, 1928, Ann. Transvaal Mus. 12: 236 (in key), 246, ♀ ♂, Fig. 4 — "Sanyati River, S. Rhodesia", R. H. R. Stevenson (types in coll. Stevenson); also 1 ♂ from Umtali, S. Rhodesia. — Id., 1951, Bull. Br. Mus. nat. Hist., Ent. 2 (3): 139 (4 ♂, Lekempti, Ethiopia). — Leclercq, 1955, Expl. Parc Nation. Upemba, Mission G. F. de Witte, etc. 34: 58 (six localities) [new synonymy].

The type locality "Let Marefià" is situated in Shoa, Ethiopia, about 16 km North of Ankober (9.32 N, 39.43 E). We have recently examined 1 ♀ 1 ♂ of the original series of syntypes and designated the ♀ as the lectotype.

Gribodo's species has not been recognized by Kohl, who in 1909 incorrectly applied the name *quartinae* to the species discussed in this paper under the name *Sc. fossuliferum*. Brauns (1911) followed him in this respect (see the references in Kohl, 1918: 105). Arnold (1928) also misapplied the name *quartinae*, but simultaneously he described some specimens from Southern Rhodesia as a new species (*fulvohirtum*), without realizing that they were very similar to the true *quartinae* from Ethiopia. When in 1952 Arnold examined some syntypes of Gribodo's *quartinae*, he admitted to have misidentified this species, but stated his *Sc. fulvohirtum* to be different: "*Sc. fulvohirtum* is closely related to this species, but is larger and has a longer and more oblique pronotum. The genitalia, although similar, have the outer paramera narrower apically and the sagittae

are of a different shape." The accompanying drawings of the genitalia, however, are rather coarse, and in our opinion do not convincingly indicate that the two forms are specifically different.

After having studied a series of specimens of *Sc. quartinae* from various localities, we have reached the conclusion that *Sc. fulvohirtum* is not specifically different from Gribodo's species. It is true that the type localities are far apart, but *Sc. quartinae* is now known from several intermediate localities. Moreover, Arnold himself in 1951 identified some specimens from Ethiopia as belonging to his *Sc. fulvohirtum.*

The specimens examined by us agree well with the types; there is some variation in the pubescence of head and thorax, which in the types appears to be somewhat longer and denser than in several other specimens. The available material is partly worn, however, and does not permit to determine whether this character is subject to geographic variation. The shape of the pronotum is somewhat variable, but it is always more swollen than in *Sc. fossuliferum* and *madraspatanum.*

Cameroon: Uam-area, Bosum, 3 ♀ 21—30 April 1914, 7 ♂ 11—20 June 1914, leg. Tessmann (ZMB; 1 ♀ 2 ♂ ML).

French Sudan: 1 ♀ Middle Niger, Diafarabe, May 1932, O. B. Lean (BM).

Ethiopia: Let Marefià (syntypes of *Sc. quartinae*; MCG, NMW and MP); 4 ♂ Lekempti (BM; see Arnold, 1951).

Uganda: 1 ♂ Mbale-Kami Rd., 3700 ft., S. of L. Salisbury, 15—17 Aug. 1911, S. A. Neave (BM); 1 ♀ Katona, Mto-ya-Kifaru (MBUD); 1 ♂ Katona, Mujenje, Aug. 1913 (MBUD).

Kenya: 1 ♀ Nandi Plateau, 5700—6200 ft., 30 May—4 June 1911, S. A. Neave (BM); 1 ♀ Crater Lake 9 miles N.W. of Meru, 5700 ft., 15 Febr. 1911, S. A. Neave (BM); 1 ♂ L. Baringo, 1931, E. B. Worthington, Cambridge Univ. Exp. (BM).

Tanganyika: "Matengo Hochland, WSW. von Songea, Ugano", 2 ♀ 1 ♂ Dec. 1935—March 1936, leg. Zerny, 1 ♀ 22 Jan. 1938, F. Zimmer (NMW; 1 ♀ ML); 1 ♀ 1 ♂ S.W. Sagalla Swamp, Mpembene, 3760 ft., 15 Oct. 1947, 1 ♂ Malagarasi, 100 mls. E. of Kigoma, 3730 ft., 7 Nov. 1947, M. Steele (BM).

Congo: 1 ♀ Katanga, Tenke, 30 July—9 Aug. 1931, J. Ogilvie (BM). Recorded from Boma, Mwashya, Katanga, and Bolobo by Leclercq (1955).

Zambia: recorded from Abercorn (N. Rhodesia) by Leclerq, 1955.

Nyasaland: 1 ♂ Chitala Stream, 10 m West of Domita Bay, 22—28 Oct. 1910, S. A. Neave (BM; posterior surface of propodeum with transverse yellow spot).

Rhodesia: 1 ♀Matetsi, 6 Nov. 1934, R. H. R. Stevenson (BM; "compared with type [of *fulvohirtum*] in coll. Stevenson"), 1 ♀ Bulawayo, 10 Dec. 1931, R. H. R. Stevenson (BM); 1 ♂ Bambesi R. (BM).

South Africa: 1 ♀ Cape of Good Hope (ML); 1 ♀ Cape Province, Huguenot, Febr. 1932, Miss A. Mackie (BM); 2 ♀ 3 ♂ Wellington, Rooshoek, Jan.-Febr. 1960, A. Mirjam Verhoeff (PV). Recorded from Pietermaritzburg and Algoa Bay by Leclercq, 1955.

Variation. — The Museum at Budapest possesses a male from "D.O. Afrika, A. Böttcher", which is remarkable for the unusual colour pattern. The pronotum has a dorsal yellow band, furthermore are yellow: the tegulae, two small spots on the mesepisternum beneath the tegulae, a spot on the scutellum and a rather large spot at the apex of the propodeum.

The pattern is very similar to that of certain forms of *Sc. madraspatanum*; the structure of the pronotum and the sculpture of the propodeum leave no doubt, however, that this specimen belongs to *quartinae.* It is impossible to say whether this is an individual aberration or a representative of a population which is constantly more extensively marked with yellow.

Sceliphron (Sceliphron) fossuliferum (Gribodo)
(= *Sceliphron quartinae* auctt., nec Gribodo)

This is the commoner of the two representatives of the *madraspatanum*-group in the Ethiopian region.

For a long time this species has been called *quartinae*, but this error was corrected by Arnold (1952), who examined some of Gribodo's "cotypes" (syntypes). However, this author failed to discover that *Sc. fossuliferum* (Gribodo) is the same as *quartinae* auctt. nec Gribodo. The name *decipiens*, proposed by Arnold (1952) for the species erroneously described by him in 1928 as *quartinae*, is therefore superfluous.

We agree with Leclercq (1955) that *Sc. voeltzkowii* Kohl may be regarded as a subspecies of *Sc. quartinae* auctt., but we prefer not to follow him in treating *voeltzkowii* Kohl and *complex* Kohl as identical. These names were based on specimens showing distinctly different degrees of melanization, and as there are indications that this variation is at least to some extent correlated with the geographic and the vertical distribution (melanism apparently being more common in mountain areas), the names may prove useful in further studies of the relationships. It should be noted that the pigmentation of *Sc. masaicum* Turner is practically identical with that of *Sc. voeltzkowii* Kohl, and not with that of *Sc. complex* Kohl, as suggested by Arnold (1928: 246).

The typical form appears to occur throughout the entire Ethiopian region. According to Arnold (1928) it occurs in East Africa from Sudan to Port Elizabeth and has also been recorded from West Africa, Transvaal and Sicily [the latter record is certainly incorrect!]; Leclercq (1955) has recorded it from Ethiopia, Congo, and Cape of Good Hope.

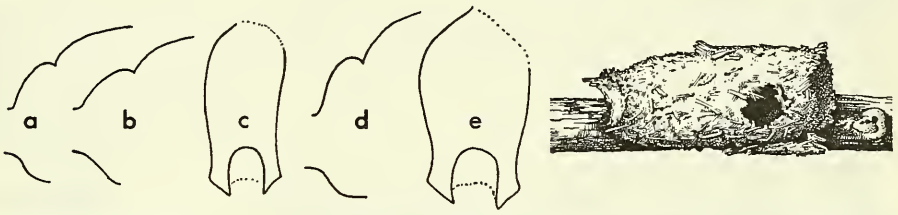
The specimens listed below have been examined by us in the last two years; previously the senior author has identified many specimens in the museums of London, Paris, and Vienna as "*quartinae*", but this material should be checked, for it seems now possible that a few specimens will prove to belong to the true *Sc. quartinae*.

In the key on p. 193 *Sc. fossuliferum* is separated from the closely allied *Sc. madraspatanum* by the colour of the tegulae. If this was the only difference, these two allopatric forms could hardly be regarded as specifically distinct. In addition to certain differences in sculpture and pubescence, however, we found that the male genitalia, although very similar, can be readily distinguished. In specimens of *Sc. madraspatanum* from various parts of its extensive range the pubescence of the volsella was constantly found to be longer than in *Sc. fossuliferum* (Fig. 5 and 6).

It is of interest to note that the American species agree in this respect with *Sc. madraspatanum*, whereas in the other African species, *Sc. quartinae* (Grib.), the pubescence is as short as in *Sc. fossuliferum*. This appears to support our view that *Sc. madraspatanum* and *fossuliferum* are different species.

Bionomics. — According to Brauns (1911: 119) *Sc. quartinae* Grib. builds its cells on grass stems and branches, either singly or in pairs; at Port Elizabeth the cells are made of moist loam, but at Delagoa Bay in Mozambique the wasps used moist dung for this purpose. It seems now practically certain that the nests observed by Brauns at Delagoa Bay were constructed by *Sc. fossuliferum*; whether this species uses clay or loam for building its cells as well as dung, deserves confirmation. The possibility exists that the nests found by Brauns at Port Elizabeth were constructed by the true *Sc. quartinae* (nec auctt.).

Kohl (1918, Pl. II, Fig. 11: 153) published a figure of a nest of "*Sc. quartinae* Grib. (oder *spirifex* L.)", built on a branch and consisting of cow dung ("Rinderkot"). This nest seems to contain two cells, but Mayer and von Schulthess (1922) state that the nest sent by them to Kohl and figured by this author consisted of three cells; it was collected by Junod at Shilouvane in Northern Transvaal. Afterwards Junod collected at Rikatla and Delagoa Bay two more nests of cow dung, both of four cells, one built on a palm leaf (figured on the accompanying plate, Fig. 4 = Fig. 1 in "Erklärung") and one on a branch of a shrub. In 1947 Dr. Burtt found such cells in Tanganyika (our Fig. 13).



Sc. quartinae (Grib.)
a,c: Wellington, S. Africa
b Uam-area, Cameroon

Sc. fossuliferum (Grib.)
Katona, Uganda

Sc. fossuliferum (Grib.)
cell of manure on branch
Tanganyika

Fig. 13. African species; a, b, d: outline of pronotum and anterior part of mesoscutum (lateral view), c, e: dorsal view of left hind coxa.

The following key may serve to distinguish the three subspecies recognized in this paper.

1. Gastral petiole entirely yellow. Antennal scape black. Apex of femora and most of the tibiae of fore and mid legs yellow (mid tibiae, and often also the fore tibiae, with dark spot of variable size at apex); trochanters, basal half of femora and basal half (or more) of tibiae of hind legs yellow . . . . . *fossuliferum* (Gribodo)
— Gastral petiole partly black. Antennal scapes usually partly or entirely dark red. Legs less extensively marked with yellow 2
2. Approximately the basal half to two-thirds of the petiole yellow. Fore and mid legs black, partly reddish, base of tibiae sometimes partly yellow; hind legs as in *fossuliferum*, but the tibiae only with yellow ring at the base. — Mainly in the mountains of East Africa . . . . . *voeltzkowii* Kohl
— At most the basal third of the petiole yellow. Legs black, only hind trochanters and approximately the basal one-fourth of the hind femora yellow; fore femora and tibiae partly reddish. — Mainly in West Africa (?) . . . . . *complex* Kohl

Sceliphron fossuliferum fossuliferum (Gribodo)

Pelopoeus fossuliferus Gribodo, 1895, Memorie R. Accad. Sci. Bologna (5) 5: 110, ♀ — "Rikatla", Mozambique (MCG).

Sceliphron (*Pelopoeus*) *fossuliferum*; Kohl, 1918, Annln naturh. Mus. Wien 32: 135 (unidentified species; incorrectly on p. 105 in synonymy of *Sc. quartinae*!). — Arnold, 1952, Occ. Papers Nat. Mus. S. Rhodesia 2 (17): 480, ♂, F. 17 (Portuguese East Africa).

Sceliphron quartinae; H. Brauns, 1911, Z. wiss. InsektBiol. 7: 119 (bionomics) [misidentification]. — Kohl, 1918, Annln naturh. Mus. Wien 32: 105, ♀ ♂ [misidentification; probably mixed up with true *Sc. quartinae*]. — Mayer & von Schulthess, 1922, Mitt. Ent. Zürich, Heft 6: 364 and plate (notes on nests). — Von Schulthess, 1926, Verh. III Intern. Kongresz 2: 21. — Arnold, 1928, Ann. Transvaal Mus. 12: 245, ♀ ♂, Figs. 3, 4a.

Sceliphron quartinae quartinae; Leclercq, 1955: 59 (Congo; Ethiopia; Cape of Good Hope).

Sceliphron decipiens Arnold, 1952, Occ. Papers nat. Mus. S. Rhodesia 2 (17): 482 (new name for *Sc. quartinae* sensu Arnold, 1928, nec Gribodo; type ♀, Unyoro, Uganda, in NMSR) [new synonymy]).

Senegal: 1 ♂ Diafarabe, 14 Aug. 1944, K. M. Guichard (BM).
Ghana: 1 ♂ "Gold Coast", N. Territories, Prang, 9 Febr. 1913, J. J. Simpson (ML).
Sudan: 2 ♀ W. Darfur, E. Jebel Murra, Kirima, 5525 ft., 20 May 1932, M. Steele (BM).
Ethiopia: 1 ♀ Sidamo, 25 Febr. 1912, 2 ♂ Tshertsher, Oct. 1911, Kovacs (MBUD).
Uganda: 1 ♀ Mbale-Kami Road, 3700 ft., S. of Salisbury, 15—17 Aug. 1911, S. A. Neave (ML); 1 ♂ Entebbe, Nov. 1912, G. C. Gowdey (ML); Katona, 2 ♀ 2 ♂ Mto-ya-Kifaru, 1 ♀ 1 ♂ Shirati, 1909 (MBUD; ML).
Tanganyika: 1 ♀ leg. W. A. Collier (ML); 1 ♂ "Dtsch. O. Afrika" (ML); 4 ♂ Shinyanga, 23 July 1947, "on manyava", from cells of dung attached separately lengthwise to a branch (Fig. 13), Dr. E. Burtt (BM, Comm. Inst. Ent. no. 10878); 3 ♀ S.W. Sagalla Swamp, Mpembene, 3760 ft., 15 Oct. 1947, waterhole, M. Steele; 1 ♂ S.W. Sagalla Swamp, Chunge, 3780 ft., 25 Oct. 1947, M. Steele; 1 ♂ Malagarasi, 100 mls. E. of Kigoma, 3730 ft., 7 Nov. 1947, M. Steele (BM).
Congo: 1 ♀ Elizabethville, 11 Sept. 1931, J. Ogilvie (BM).
Zambia: 2 ♂ "N.E. Rhodesia", Upper Luangwa R., July-Aug. 1910, S. A. Neave (BM; ML), 1 ♂ do., Mid Luangwa R., Aug. 1910, S. A. Neave (ML).
Malawi: 1 ♂ Chitala Stream, Domira Bay, 22—28 Oct. 1910, S. A. Neave (BM); 1 ♂ Mbamba Bay, 12—16 April 1936, leg. Zerny (NMW).
Rhodesia: 1 ♀ 1 ♂ leg. H. S. Leeson (BM); 1 ♀ Shangani, De Beer's Ranch, May 1962, J. Ogilvie (BM).
Mozambique: 1 ♀ Delagoa (*quartinae* Grib., det. Kohl) (MBUD).

Sceliphron fossuliferum voeltzkowii Kohl

Sceliphron (*Pelopoeus*) *voeltzkowii* Kohl, 1909, in Voeltzkow, Reise in Ostafrika 2: 370, ♀, Fig. 2 — "Chake-Chake (Pemba)", North West Tanganyika.
Sceliphron (*Pelopoeus*) *quartinae* var. *voeltzkovii* (!); Kohl, 1918, Annln naturh. Mus. Wien 32: 106. — Arnold, 1928, Ann. Transvaal Mus. 12: 245 (*voeltzkovii*(!); "race" of *Sc. quartinae*).
Sceliphron quartinae voeltzkovii (!); Leclercq, 1955: 59 (Cameroons; Congo).
Sceliphron masaicum Turner, 1919, Ann. Mag. nat. Hist. (9) 3: 393, ♀ — series from "British East Africa" (Kenya and Uganda); lectotype by present designation: Kenya, Ngare Narok, Masai Reserve, 31 Dec. 1913, A. O. Luckman (BM, type no. 21.607).

Nigeria: 1 ♀ Lagos, Ajouta(?), 29 Jan. 1957 (BM, 1959-107).
Kenya: series (incl. lectotype) from Ngare Narok, Masai Reserve, 31 Dec. 1913, A. O. Luckman (BM; antennal scape sometimes almost black); 1 ♂ Shimba, July 1912, Dr. A. D. Milne (BM, 1913-192).
Uganda: 1 ♀ Tero forest, S.E. Buddu, 3800 ft., 26—30 Sept. 1911, S. A. Neave (ML).
Tanganyika: 2 ♀ Tendaguru, 4—7 July 1924, W. E. Cutler (BM, 1930-489; 1 ♀ ML).
Malawi: 1 ♂ Nyasa Lake, Mbamba Bay, 12—16 April 1936, Zerny (NMW).

Sceliphron fossuliferum complex Kohl

Sceliphron (*Pelopoeus*) *complex* Kohl, 1918, Annln naturh. Mus. Wien 32: 107, ♀ — "Choutes (!) de Samlia River, N. Gamio (Mocquereys)". — Arnold, 1928, Ann. Transvaal Mus. 12: 246 (syn.: *Sc. massaicum* Turner).
Sceliphron (*Sceliphron*) *complex*; Leclercq, 1955: 59 (in synonymy of *Sc. quartinae voeltzkovii* (!) Kohl; Ruanda, Nyangwa, 2000 m).

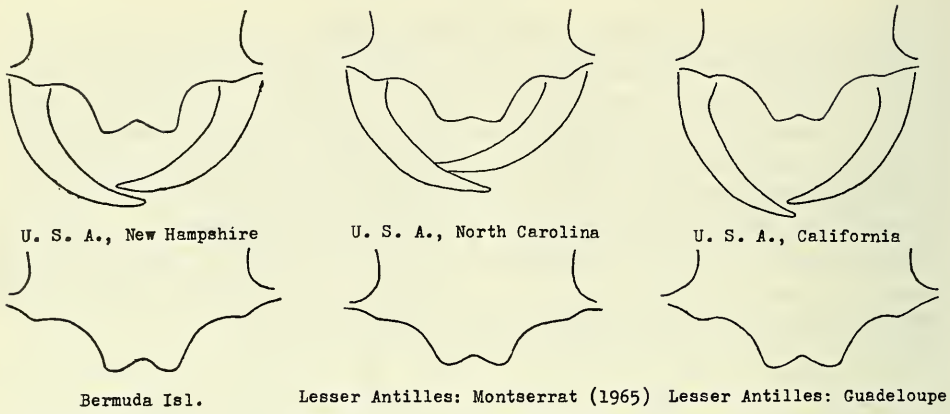
Gabon: 1 ♀ Chutes de Samlia, Riv. N'Gamio, leg. Mocquereys (type, NMW).
Spanish Guinea: 3 ♀ "Alcu, Benito-Gebiet", Aug.-Sept. 1906, G. Tessmann (ZMB; 1 ♀ ML).
"West Afrika": 1 ♀ Uelleburg, G. Tessmann (ZMB).

2. New World species

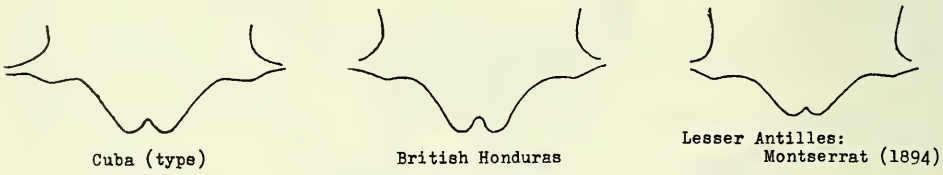
The distribution of the American species of the *madraspatanum*-group is remarkable (Fig. 14). On the basis of morphological characters it is possible to distinguish six species. They can be arranged in two subgroups: (a) three "mainland species", inhabiting North, Central, and South America, respectively, and together forming one superspecies, and (b) three "insular species" which are almost restricted to the West Indian islands. These subgroups are not sharply separated. Both the North and the Central American species (*Sc. caementarium* and *assimile*, respectively) are also found on some of the West-Indian islands, and one of the insular species, *Sc. jamaicense*, appears to be only subspecifically different from a form which inhabits Lower California (*lucae*).

Fig. 14. Approximate distribution of the *madraspatanum*-group in the New World, with figures of the volsella of each species (cf. fig. 8). Cuba should be shaded like Central America.

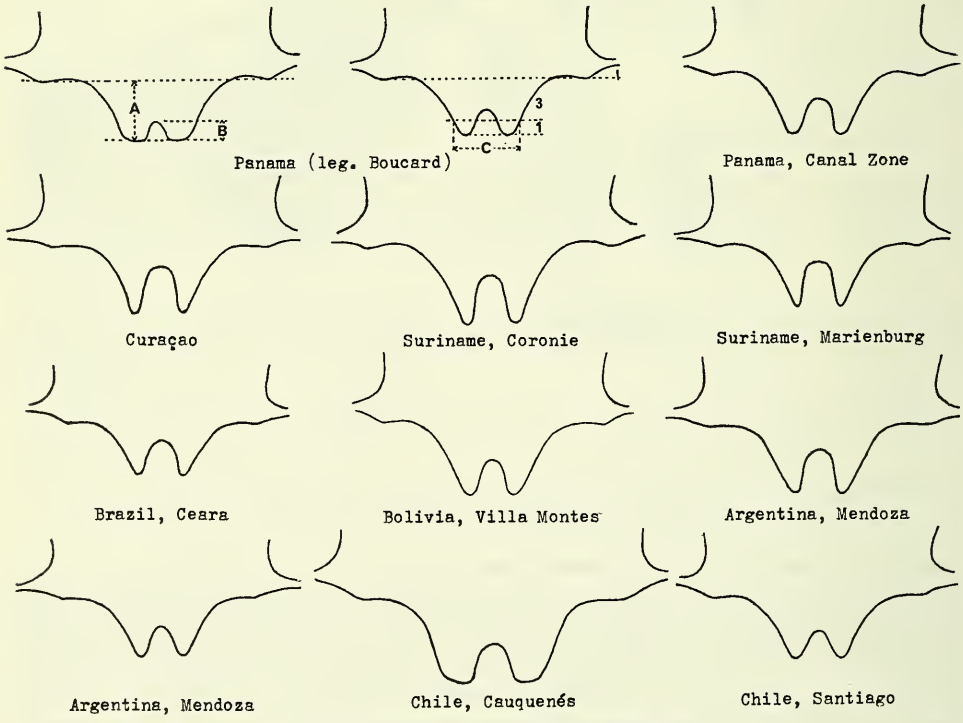
In the greater part of the American area the group is represented by only a single species, in other words the species are mainly allopatric. But some localities, particularly in the West Indian islands, appear to be inhabited by more than one species. Three species have been recorded from Cuba (*Sc. assimile, argentifrons* and *jamaicense*), and from Mexico (*Sc. caementarium, assimile* and *jamaicense lucae*), but especially in the latter case the sympatric occurrence deserves confirmation; in Puerto Rico both *Sc. caementarium* and *assimile* have been collected recently; Jamaica appears to be inhabited by *Sc. assimile* and *jamaicense*, Hispaniola by *Sc. fasciatum* and *jamaicense*.



Sc. caementarium



Sc. assimile



Sc. asiaticum (= figulum)

Fig. 15. Anterior part of clypeus of the males of the three American mainland species

It must be remarked, however, that some of the observations are not synchronous and that the possibility of temporary and local, relatively short-lived, invasions should not be excluded. It would therefore be of particular interest to determine whether the absence of recent records of, for example, *Sc. assimile* in Texas and *Sc. fasciatum* in St. Vincent, really reflects the present distribution of these species. Especially in smaller islands the turnover may be relatively rapid (Mayr, 1965).

With regard to the distribution of the American species in general it is of interest to note that within ten years after the appearance of Darwin's "Origin of Species" H. de Saussure (1867) wrote: "Man sieht hier deutlich wie der amerikanische *Pelopeus* (sic!), indem er sich vom Norden nach Süden ausbreitete, sich erst in locale Varietäten auflöste, sich aber später in dem Maasse wie diese Varietäten auseinander gingen, zu förmlich gesonderten geographischen Arten gestalteten, welche nun durch neue Migrationen geographisch in einander greifen".

Since Porter (1926) differences in the shape of the clypeus have been used to separate the males of the three common mainland species. Kohl (1918) did not know the male of the Central American *Sc. assimile*, which in this respect is intermediate between the North American *Sc. caementarium* and the South American *Sc. asiaticum*. It has proved of interest to make a detailed study of the male clypeus and its variability in the American mainland species (Fig. 15). For this purpose we have measured the following variables:

A. the length of the anterior part of the clypeus, i.e. the portion protruding beyond a line through the blunt lateral angles (Fig. 15, top row of *Sc. asiaticum*),

B. the depth of the incision between the apical teeth (= the length of the apical teeth),

C. the width of the anterior part of the clypeus, measured at 1/4 of its length from the apex.

In order to reduce the influence of the variation in size of the head, all measures have been expressed in percentages of the interocular distance at the clypeus.

The results of measuring A and B in the available males are shown in table 1 and in Fig. 16.

Table 1. Measurements of clypeus of males of three American species.

species	number	locality	A (length of anterior portion)	B (length of teeth)
Sc. caementarium	15	U.S.A.	20.7—24.4, av. 22.8	2.1— 6.2, av. 4.2
	10	Lesser Antilles	20.5—25.0, av. 22.5	4.1— 5.5, av. 4.7
Sc. assimile	10	Texas - Costa Rica	23.2—28.2, av. 25.7	4.4— 7.9, av. 5.7
	9	Cuba	23.4—27.0, av. 25.4	4.4— 6.7, av. 5.6
	7	Jamaica; P. Rico	23.0—26.2, av. 24.7	4.3— 5.6, av. 4.9
	20	Lesser Antilles	21.5—27.5, av. 24.4	2.5— 5.6, av. 4.4
Sc. asiaticum	3	Panama	26.6—28.1, av. 27.6	8.7—16.6, av. 12.6
	14	Colombia - Suriname	28.5—32.5, av. 30.1	18.1—22.8, av. 20.1
	12	Bolivia - Argentina	27.4—32.2, av. 28.5	11.6—20.9, av. 16.4

It appears from these figures that the anterior portion of the clypeus is relatively slightly longer in *assimile* than in *caementarium*, but that in general these two species are close together, and that there is a considerable amount of overlapping. The South-American *Sc. asiaticum*, although very variable, particularly in the length of the clypeal teeth, is distinctly separated from the two others.[1])

[1]) Apparently Kohl (1918) has overlooked that the two figures of the head of "*Sc. figulus*" in his paper (Fig. 31 and 59) differ considerably, at least he does not comment on this fact.

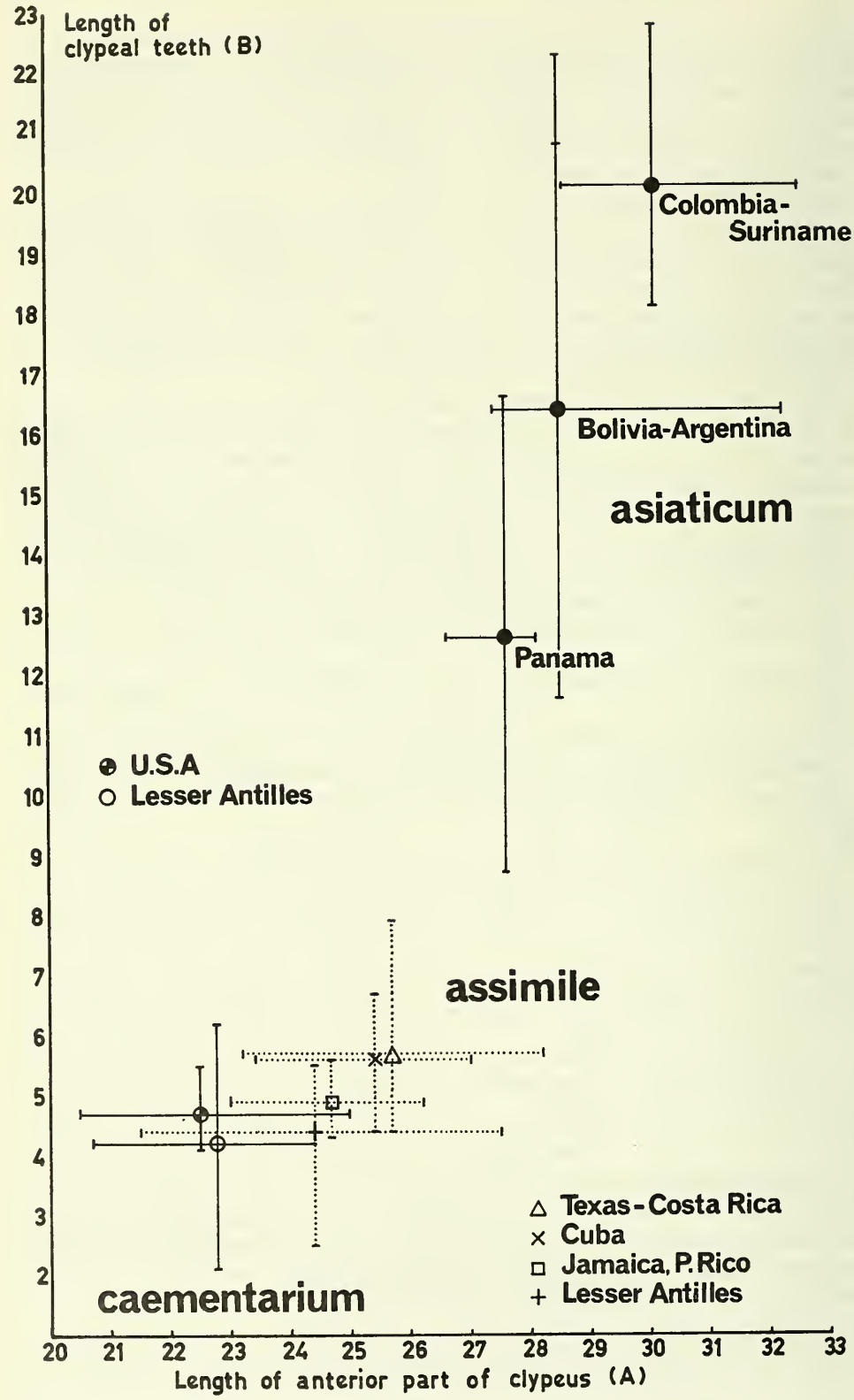


Fig. 16. Average and range of measurements A and B in ♂ of the three American mainland species

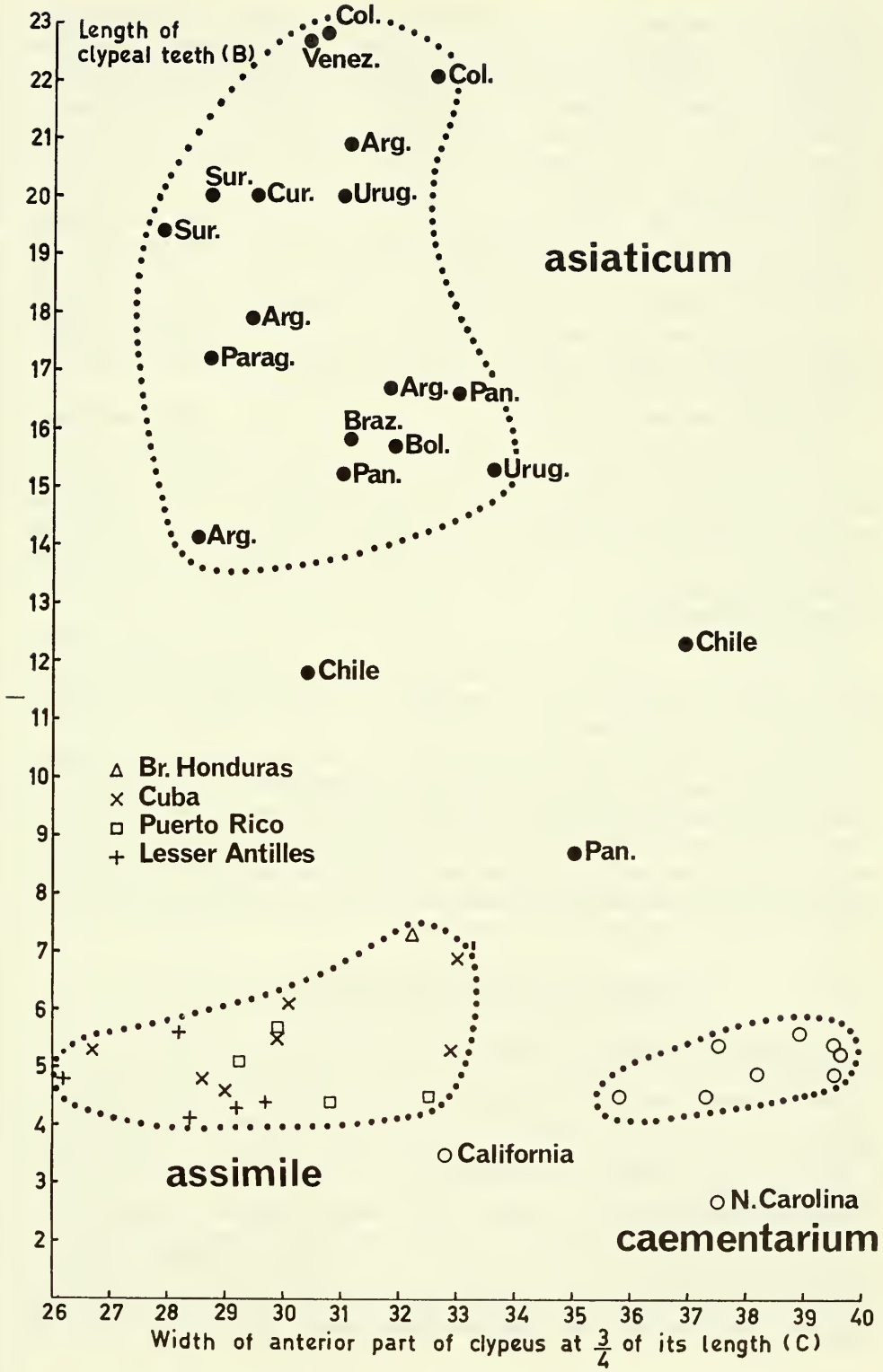


Fig. 17. Measurements B and C of males of the three American mainland species

The nature of the variation in *Sc. asiaticum* deserves some comments. The few available specimens from Panama (Fig. 15) seem to be transitional between *assimile* and *asiaticum* and suggest that in this area some hybridization may occur. In a series of specimens, here indicated as "Colombia-Suriname" and comprising three males from Colombia, one from Venezuela, three from Curaçao and six from Suriname, the clypeal teeth are without exception long and sharp, a condition which is only rarely found in males from the southern part of South America.

It is evident from Fig. 15 that *Sc. assimile* differs from *Sc. caementarium* in having the clypeus more strongly narrowed anteriorly. In order to express this difference we have measured the width of the anterior portion of the clypeus at three fourths of its length in a number of males of each of the three species. The results are shown in a diagram (Fig. 17), in relation to the length of the clypeal teeth, again expressed as percentages of the width of the smallest interocular distance at the clypeus. It is evident that in this way the males of the three specimens are rather clearly separated.

Unfortunately we have failed to discover constant and reliable differences between the females of *Sc. assimile* and *Sc. asiaticum*. Both are easily distinguished from the North American *Sc. caementarium* by the pronounced reduction of the yellow colour on the hind tibiae. Moreover we have found that in Central America, where *Sc. assimile* and *caementarium* may occur together, the yellow spots at the base of the propodeum, regularly present in the former, are absent in the latter. It is possible, however, that this difference will prove to be less reliable than it seems to be on the basis of the limited material now available to us.

In the females of *Sc. assimile* the hind tibiae usually have a yellow stripe of variable length on the inner (under) side, whereas specimens with entirely black tibiae are not rare in samples of *Sc. asiaticum*; yet as far south as Argentina one may find specimens which agree in this respect with *Sc. assimile*.

Concerning the three remaining American species (Fig. 14 and 18) we may remark that they form a rather heterogeneous group. *Sc. argentifrons* and *fasciatum*, hitherto not separated, are closely related inhabitants of some of the West Indian islands. They differ from the other American species in numerous characters, which suggests that they have become isolated rather long ago. *Sc. jamaicense*, on the other hand, resembles *Sc. caementarium* very closely, particularly in the shape of the clypeus and the genitalia of the male, and is likely to have originated at a later date.

Sceliphron (Sceliphron) caementarium (Drury)

?"Guêpe ichneumon & maçonne", Réaumur, 1742, Mém. Hist. Ins. 6: 278, 279, Pl. 28 F. 4, 5 — "Saint Domingue".

Sphex caementaria Drury, 1773, Illustr. Nat. Hist. 2, Index for vol. 1; description in vol. 1 (1770): 105, F. 6—8, Pl. 45 F. 8—10 (nest) — "Antigua, St. Christopher's and Jamaica" (types lost).

Sphex flavo-maculata DeGeer, 1773, Mém. serv. Hist. Ins. 3: 588, Pl. 30 F. 4 — "Pensylvanie", leg. Acrelius (NRS).

Sphex lunata Fabricius, 1775, Syst. Entom.: 347 — "Antigua", leg. Drury (lectotype in coll. Fabricius, UZMC).

Sphex flavipes Fabricius, 1781, Spec. Insect. 1: 444 — "America", leg. Blackburn (lectotype in coll. Fabricius, UZMC).

Sphex flavipunctata Christ, 1791, Naturg. d. Insekt.: 301, Pl. 30 F. 1, ♀ — "Antigua, St. Christoph und Jamaika" (new name for *Sphex caementaria* Drury).

Sphex affinis Fabricius, 1793, Entom. Syst. 2: 203 — "in Americae Insulis", leg. von Rohr (syntypes in coll. Fabricius, UZMC).

Pelopoeus architectus (Klug) Lepeletier, 1845, Hist. Nat. Ins. Hym. 3: 313, ♀ — "New Orleans", coll. Spinola (?MT) [omitted by Kohl, 1918].

Pelopoeus servillei Lepeletier, 1845, Hist. Nat. Ins. Hym. 3: 313, ♀ — "Sans patrie", coll. Serville (MT).

Pelopoeus solieri Lepeletier, 1845, Hist. Nat. Ins. Hym. 3: 318, ♀ — "Guadeloupe", coll. Serville (MT).

Pelopoeus canadensis Smith, 1856, Cat. Hym. Brit. Mus. 4: 233, ♂ — "Canada" (BM, type no. 21.617).

Pelopoeus nigriventris Costa, 1864, Ann. Mus. Zool. Napoli 2 (1862): 60 — North America (Mus. Naples).

Pelopoeus tahitensis Saussure, 1867, Reise "Novara", Zool. 2, Hym.: 27, ♀ ♂, Pl. 2 F. 17 — "Otahiti" (MNHG).

Sceliphron (*Pelopoeus*) *caementarium*; Kohl, 1918, Annln naturh. Mus. Wien 32: 115.

Sceliphron caementarium; Porter, 1926, Proc. U.S. nation. Mus. 70: 5; Krombein, 1949, Proc. Hawaii. ent. Soc. 13: 388 (Marshall Is. and Mariana Is.); Bohart and Menke, 1963, Univ. of Calif. Publ. Ent. 30: 116.

Sceliphron caementarium is remarkable for having spread, more or less recently, far beyond the limits of its original range. The colonizing capacity is even more pronounced here than in *Sc. madraspatanum*. The originally North American species has not only become established in many islands in the Pacific, in the West Indies and in Madeira (here at least since 1825), but in recent years it appears also to have gained a foothold in Peru and in Japan. It will be interesting to see how the species will behave in these new habitats.

The abundance of names applied to this species is partly due to the rather variable colour pattern. Initially almost every specimen not agreeing perfectly with an existing description was described as a new species. H. de Saussure (1867) was the first to recognize the variability of such characters as pubescence, coloration, and size. He wrote: "Die Auctoren haben deswegen eine Menge Arten aufgestellt, welche aber nur verschiedene vom Klima erzeugte Modificationen weniger Formen darstellen." He accepted *Sc. servillei* with some doubt as a separate species and enumerated five varieties or "species nascentes" as forms of *Sc. caementarium*.

Kohl (1918) arranged the eight colour varieties known to him in a key which clearly demonstrates that the variation is correlated with the distribution to a very limited extent only.

Bohart and Menke (1963) discuss the variation in colour pattern in rather general terms and do not use the existing names. They point out that specimens from Canada and the northern United States show a great reduction in the amount of yellow, and that southward the yellow markings increase in size. They suggest that "this clinal variation is probably explained by climatic factors".

Evidently it is neither possible nor desirable to describe the variation of this species on the American continent in terms of subspecies. Yet it seems useful to describe the colour pattern of certain more or less homogeneous populations, particularly of those units which have recently become established outside of the original range. It is evident that these immigrants are now often living under ecological conditions which are much different from those prevailing in their country of origin, and that their colour patterns may not be in accordance with the correlations observed on the American mainland. Perhaps a detailed study of the colour patterns might tell us something about the origin

of these immigrants; furthermore it would be of interest to determine whether the patterns of the insular isolates are likely to change within relatively short periods under the influence of different selection pressures.

For this purpose it would be useful to describe the colour patterns in a concise way, and this might perhaps be done as follows:

Thorax:	only the tegulae yellow	0
	markings more or less reduced	1
	markings complete (pronotum, mesepisternum, scutellum, postscutellum)	2
Propodeum:	black	0
	declivity ± yellow	1
	basal spots and declivity yellow	2
	also dorsum partly yellow	3
Gastral petiole:	black	0
	partly yellow	1
	entirely yellow	2
First gastral tergite:	black	0
	spots or narrow apical band	1
	wide apical band (at least half the length) to entirely yellow	2

On this basis the pattern of the colour forms distinguished by Kohl (A—H) and other authors may be described as follows:

Var. A = *flavipes*	0	0	0	0
Var. B	0	0	0	1
Var. C	1	0	0	0
Var. D	1	0	0	1
Var. E = *affine* = *nigriventre*	1—2	0	0	0
Var. F = *caementarium* = *flavomaculatum* = *lunatum* = *architectum* (2.1.0.0.) = *solieri* = *canadense* (♂) = *tahitense*	2	1	0	1—2
Var. G	2	2—3	0—1	2
Var. H = *servillei*	2	2—3	2	2

Northern America: see Bohart and Menke, 1963: 115, 117, Fig. 8; also Pilon and Steiner, 1966: 484 and Fig. 2.

Key West: 1 ♀ June 1925, H. Boschma (ML).

Bermuda Is.: 1 ♀ Bermuda, Owen Bryant, 1 ♂ do., W. S. Brooks (MCZ). 1 ♂ Aug.-Sept. 1928, H. Boschma (ML); 2 ♀ 1 ♂ Bermuda, July 1925 (BM, 1925-351).

Mexico: "Mexico", 1 ♀ Sommer, 1 ♀ 1 ♂ Sallé, 1 ♀ Boucard (NRS).

Puerto Rico: 1 ♀ Mayaguez, coll. E. Vázquez (MCZ), 1 ♀ Adjuntas, 16 Febr. 1965, coll. Mendez (MCZ); 1 ♂ Ponce, 1935, coll. L. Rivara (Puvera?) (MCZ).

Lesser Antilles: St. Thomas, 1 ♀ "*P. lunatus* F.", coll. Westermann (UZMC), 4 ♀ leg. Eggers (UZMC, 1 ♀ ML), 1 ♂ coll. Hauschild (UZMC; thorax with extensive yellow markings, propodeum with basal spots, posterior mark with "horns" on dorsal area, petiole black, tergite 1 almost entirely yellow; index of pattern = 2302), 2 ♀ leg. Orsted (UZMC). — St. Croix, 1 ♀ coll. Hauschild (UZMC, tergite 1 almost black). — Montserrat, 2 ♀ Montserrat, 8 Sept., Pomerat coll. (MCZ), 1 ♀ Bot. Garden, 1931, C. A. Gomez, 1 ♀ 11 Febr. 1931, Lt. A. D. Torlesse (BM); 1 ♂ Belham River, 14 June 1965, 6 ♀ 7 ♂ Plymouth, 14—15 June 1965, D. C. Geijskes and Mrs. E. Geijskes (ML; in all specimens gastral petiole entirely black; propodeum without basal spots, except in one ♂ which has small spots). — Guadeloupe, 1 ♀ 2 ♂ Pointe-A Pitre, 7 June 1965,

D. C. Geijskes (ML). — Martinique, 6 ♀ (old specimens) "Martinique" (MCZ); 1 ♂ do., Ruins of St. Pierre, Virginia Exp. (MCZ), 1 ♀ 30 Sept. 1925, L. E. Cheesman (BM). — St. Vincent, 1 ♂ (BM). — Grenadines, 11 ♀ Moustique I., H. H. Smith (BM).

Peru: 3 ♀ 1 ♂ Sullana (4.52 S., 80.39 W.), Hda. Mallares, May 1954 (1 ♀), Aug. 1954 (1 ♂) and May 1955 (2 ♀), W. Markl (NMB; 1 ♀ ML). — Evidently a recent introduction.

Madeira: 4 ♀ Madeira, leg. Wollaston (BM); 1 ♀ Madeira, 1825, coll. Hauschild, 1 ♂ do., Rathke, coll. Sehestedt — T. Lund (UZMC); Madère, env. de Funchal, 1936, L. Chopard (MP).

Japan: According to information received from Prof. Iwata in 1960 this species was accidentally introduced into Japan after the second world war; he said that it has become established there near the cities of Tokyo, Yokohama, and Osaka; recently, Prof. K. Tsuneki wrote us that it occurs throughout the flat land of Kanto Province, but that Osaka may be an incorrect record. Its life history in Japan was studied by Dr. Toshitomo Shida, 1952 (Shin Konchû 5, no. 3).

Hawaiian Is.: in a series from these islands (BM) the yellow markings show a tendency to disappear.

Wallis Is.: 3 ♀ 12 Nov. 1958, J. Rageau (BM, 1958-713).

Samoa: 1 ♂ W. Samoa, Aitutaki, March 1958 (LAM; propodeum with reduced yellow mark at apex; petiole black, tergite 1 with yellow band).

Society Is.: 1 ♀ Raiatea, 26 May 1925, 1 ♀ Bora bora, L. E. Cheesman (BM); Tahiti, 6 March 1925, L. E. Cheesman (BM); 1 ♀ 1 ♂ Tahiti, Papeari, April 1926, coll. G. Olrik (UZMC); series Papeete (MP).

Marquesas Is.: 2 ♀ Hiva-Oa, series Futa-Hiva and Nuku-Hiva, 1925, L. E. Cheesman (BM); series "Nukuhiva" (MP).

Gambier Is.: series from Mangareva, Rikitea, 1905, G. Seurat (MP).

New Caledonia: 7 ♀ 2 ♂ Anse Vata, Jan.-Febr. 1957, J. Rageau (BM); series Nouméa (MP).

Additional localities where the species has been introduced more or less recently: Marshall Islands, Marianas, and Fiji (Bohart & Menke, 1963: 117), and the area around Brisbane (in lit. Dr. E. F. Riek, Dec. 1956).

Sceliphron (Sceliphron) assimile (Dahlbom)

Pelopoeus assimilis Dahlbom, 1843, Hym. Europ. 1: 23, ♂ ♀ — "Cuba", leg. Lefebvre (Mus. Lund).

Pelopoeus cementarius [!]; Cresson, 1865, Proc. ent. Soc. Philad. 4: 134 (Cuba).

Sceliphron caementarium var. *nicaraguanum* Kohl, 1918, Annln naturh. Mus. Wien 32: 118 — "Nicaragua" (ZMB).

Sceliphron assimile; Porter, 1926, Proc. U.S. nation. Mus. 70: 9; Bohart & Menke, 1963, Univ. of Calif. Publ. Ent. 30: 115, F. 8, 61.

Porter's identification of this species was based on notes made by H. T. Fernald, who studied the types in 1913. According to Porter the range of *Sc. assimile* includes "the extreme southern part of Texas, Mexico, Central America, the West Indies, and the northern part of South America". This is partly incorrect: there are no reliable records from South America, and the species inhabits only part of the West Indies. Bohart and Menke have recorded this species from Texas, Central America (Mexico-Panama) and Cuba. The occurrence in Panama appears to need confirmation; on the other hand there is no doubt that Jamaica, Puerto Rico, and some of the Lesser Antilles are included in the range.

It would be interesting to make a detailed study of the relations between *Sc. caementarium* and *assimile* in the zone of overlap of these species. The southern limit of the range of *Sc. caementarium* in Mexico is not well known. Whereas two females from Jalisco in the British Museum are certainly *assimile*, we noted with interest that a female from this province in the same collection has a clear yellow ring at the base of the hind

tibiae. Unfortunately this character is not reliable enough to state with certainty that this specimen is a true *caementarium*. It is desirable to pay special attention to the collecting of males in the areas where both species might occur.

Texas: 8 ♀ "Tex., no. 1576" = Brownsville, 20 July 1895, F. B. Armstrong (*figulus* det. B. A. Porter) (USNM); 1 ♀ Brownsville, 30 April 1895, C. H. T. Townsend, 1 ♂ do., without date (USNM), 1 ♂ Mission, 7 Febr. 1940, Phil Rau, no. 2384 (1 ♂ with similar label no. 2407?) (USNM); 1 ♀ Ft. Ringgold, 18 May 1895 (USNM).

Mexico: 1 ♀ 2 ♂ "Mexico", Sallé, 1 ♂ Lovén (NRS); 2 ♀ 1 ♂ "Mex", coll. Saunders (OUM); 1 ♀ Presidio, Forrer, coll. Cameron (BM); 2 ♀ Santiago Iscuintla, Jalisco, July, Schumann (BM); 1 ♂ Navarrete, Tepic, Schumann (BM); 1 ♀ 1 ♂ Colima, L. Conradt (USNM); 1 ♀ 1 ♂ Acapulco, 3 May 1952, Galathea Exp. 1950—'52 (UZMC); series of ♀ ♀ and 1 ♂ from N. Yucatan, leg. Gaumer (BM).

British Honduras: 2 ♀ Br. Honduras (BM); 1 ♂ Br. Honduras, R. Sarstoon Blancaneau (ML).

Costa Rica: 1 ♀ 1 ♂ San Lucas, July 1934, C. H. Ballou (USNM); 1 ♀ Bebedero, las Cañas, June-July 1930, Reimoser (NMW; first gastral tergite nearly black); 1 ♀ San José, Aug. 1930, Tristan (ML); 2 ♀ San José, March 1932, Schmidt (ZMB); 1 ♂ San Juan, July 1930, Tristan (NMW).

Cuba: 1 ♀ 1 ♂ "Cuba, D. Lefebvre", types (Mus. Lund); 3 ♀ 3 ♂ "Cuba, Guérin, ex coll. Monchicourt" (ML); 1 ♀ Havana, leg. Baker (BM, ex coll. Cameron, 1903-297); 1 ♀ Las Animas, Pinar del Rio, 1500 ft., 3—5 Sept. 1934, S. C. Bruner and A. R. Otero (MCZ); 1 ♀ 1 ♂ Santiago de las Vegas, Habana, 1 Nov. 1934 and 14 Sept. 1930, S. C. Bruner (MCZ). Santa Clara, 14 ♀ 4 ♂ San Blas, Trinidad Mts., Aug. 1932, B. B. Leavitt (MCZ, 1 ♀ 1 ♂ ML); 1 ♀ Buenos Aires, 8 Aug. 1932, B. B. Leavitt (MCZ); 1 ♀ Buenos Aires, Trinidad Mts., 17—23 June 1939, C. T. Parsons (MCZ); 1 ♀ Mina Carlota, Trinidad Mts., 11—16 July 1939, C. T. Parsons (MCZ). 4 ♀ 1 ♂ Soledad, Cienfuegos, Aug.-Sept. 1930, Richard Dow (MCZ); 3 ♂ Castillo de Jagua, Cienfuegos, 5 Sept. 1930, R. Dow (MCZ); 1 ♀ 2 ♂ Baragua, Camaguey, June-July 1932, Bates and Fairchild (MCZ); 1 ♀ do., July, U. C. Loftin (MCZ); 1 ♂ Jobabo, Jan., C. F. Stahl (MCZ).

Jamaica: 1 ♀ "Jamaica" (NRS); East Jamaica, 2 ♂ Golden Grove, 7 July 1962, 1 ♂ Duckenfield, 12 July 1962, G. F. Mees (ML); 2 ♀ "Jamaica, W. I.", coll. W. Schaus (USNM).

Puerto Rico: 2 ♀ 3 ♂ Mayaques, 9 Aug. 1963, P. H. van Doesburg Jr. (ML); 1 ♂ San Juan, 1—3 Febr. 1967, H. E. Evans (MCZ).

Lesser Antilles: St. Martin, 1 ♀ Rijgersma (ML). — St. Kitts, 6 ♀ 4 ♂ Basse Terre, May-June, C. Roys (MCZ); 2 ♂ Wingfield Est., 15 July 1960, Imp. College Exp. (BM). — Montserrat: 3 ♀ 6 ♂ 31 March 1894, 1 ♀ 3 ♂ "Iss." [issued] 9 May 1894 (one ♂ with label "Gen. IV"), 2 ♂ "Iss." 19 May 1894 (one ♂ with label "Gen. I", 2 ♀ 5 ♂ "Iss". 1 June 1894, 1 ♂ "Iss." 2 July 1894, 1 ♀ "Iss." 16 July 1894, C. V. Riley (USNM, no. 6204); it is of interest to note that the series "no. 6204, Montserrat, C. V. Riley" also contains a ♀ of *Sc. caementarium* (basal half of hind tibiae yellow; basal spots of propodeum lacking, but present in all specimens recorded above), collected 18 March 1894. — ?St. Lucia, 2 ♀ Vigil Beach, 16 May 1965, 1 ♀ Blue Water Beach Hotel, 20 May 1965, D. C. Geijskes (ML); the identification remains somewhat uncertain so long as no males have been collected in this island.

Sceliphron (Sceliphron) asiaticum asiaticum (Linné)

Sphex asiatica Linné, 1758, Syst. Nat., 10th ed.: 569 — "in Indiis"; 1764, Mus. Ludov. Ulric.: 405 ("Asia").

Pelopoeus figulus Dahlbom, 1843—5, Hym. Eur. 1: 23, 434, ♀ — "e Gallia meridionali", leg. Westermann (1843: 23), "America" (1845: 434).

Pelopoeus vindex Lepeletier, 1845, Hist. Nat. Ins. Hym. 3: 317, ♂ — "Cayenne", coll. Serville (MT).

Pelopoeus bimaculatus Lepeletier, 1845, Hist. Nat. Ins. Hym. 3: 319, ♀ — "Cayenne", coll. Serville (?MT).

Sceliphron (*Pelopoeus*) *figulus*; Kohl, 1918, Annln naturh. Mus. Wien 32: 119.

Sceliphron figulum; Porter, 1926, Proc. U. S. nation. Mus. 70: 11.

Sceliphron asiaticum; van der Vecht, 1959, Ent. Ber., Amst. 19: 129, 132.

Pelopoeus bimaculatus Lep. was regarded by Kohl (1918) as identical with *Sc. fistularium* (Dahlb.), but we agree with Porter (1926) that it belongs in the synonymy of *Sc. asiaticum*. The specimens recorded by Kohl from Mexico, Guatemala, and Nicaragua, almost certainly belong to *Sc. assimile*.

For a discussion of the characters of this species we may refer to the key and to pp. 217—222. The yellow markings of the propodeum are variable, as noted by Kohl (l.c.: 120); in specimens from northern localities the dorsum is often more extensively marked with yellow than in those from the central and southern parts of the range.

Panama: 2 ♀ 2 ♂ Panama, Boucard (BM); 1 ♀ 1 ♂ Ancon, C.Z., 28 April 1922, J. Zetek and F. Molino (USNM).

Colombia: series prov. Magdalena and Sevilla (BM); 1 ♂ Cali (ZMB); 1 ♀ Cali, July-Sept. 1959, J. G. Betrem, 1 ♀ Valle del Cauca, Palmira, 10 April 1959, E. Sanguino (ML).

Venezuela: 1 ♀ Merida (UZMC); 6 ♀ 2 ♂ Caracas, leg. Styrup, coll. Drewsen (UZMC); 2 ♀ Caracas, van Lansberge (ML); 5 ♀ Acosta, Falcon, leg. Kugler (NMB; 2 ♀ ML); 1 ♀ Maracay, La Trinidad, 1—14 July 1934, C. Vogl (ZMB).

Curaçao: 2 ♂ "Curaçao", leg. Father Jansen (ML); 1 ♀ Parera, 9 Febr. 1939, H. W. Cossee (ML); 1 ♀ 1 ♂ Caribbean Marine Biol. Inst., Oct.-Nov. 1956, R. H. Cobben (ML); 1 ♀ St. Barbara, 5 Sept. 1963, D. C. Geijskes (ML).

Aruba: 1 ♀ 10 May 1955, P. Wagenaar Hummelinck (ML); 2 ♀ April 1957, R. H. Cobben (ML).

Trinidad: 6 ♀ 3 ♂ Trinidad, E. B. Connell, 1914-383 (BM).

British Guyana: Richards (1937) does not mention this species; according to Bodkin (1918, Trans. R. ent. Soc. 1917: 315) it is less numerous in British Guiana than *Sc. fistularium*.

Suriname: series from the coastal area: Tibiti Savanne, Coronie, Groningen, Paramaribo and environs, Marienburg, Afobaka, Galibi, throughout the year, several collectors (ML); 1 ♀ 1 ♂ Upper Corantine River, Coeroeni Air Strip, 18—22 June 1963, J. G. Wessels Boer (ML).

Brazil: 2 ♀ "Brasilia", Esterro (MBUD); 3 ♀ 1 ♂ "Brasilia", coll. Drewsen, "*bimaculatus* Lep." (UZMC); 1 ♀ "Brasil", leg. Calkoen (ML); 2 ♀ "Brasil", from Mus. Berlin (ML); series Pará (BM); 1 ♀ 1 ♂ Ceará, 1931, Dias de la Roche (USNM); 1 ♀ Amazon, Rio Autaz, leg. Roman (NRS); 1 ♀ Santa Catarina, Nova Teutonia, Dec. 1954, P. Flaumann (ML); 1 ♀ do., without date (NRS); 1 ♀ Santa Catarina, Neu Bremen, Rio Laeiss, 5 Febr. 1933, Fr. Hoffmann (ZMB); 1 ♀ Rio Grande do Sul (ML); 1 ♀ do., San Leopoldo, J. W. Stahl (NRS); 4 ♀ 1 ♂ do., Pelotas, 10 Dec. 1947, M. de Biezanko (NMW).

Bolivia: 1 ♂ 1 ♀ Villa Montes, Oct. 1930 and Jan. 1931, resp., Eisentraut (ZMB); 1 ♀ "Bol. Chac."(?), Erland Nordenskjöld (NRS).

Paraguay: Sapucay, W. Forster (BM, 1905-188); 1 ♀ 1 ♂ Chaco, Nanawa, in copula (BM); 1 ♀ La Zanja (?La Zauja), W. Sörensen (UZMC); 7 ♀ Colon. Risso, coll. Dr. Ternez (NMB, 1 ♀ ML).

Uruguay: 3 ♀ 2 ♂ "Uruguay", leg. Boucard (NRS); 1 ♀ do., from Meyer-Dür (ML); 1 ♀ Montevideo, Galathea Exp. (UZMC); 1 ♀ do., Kröyer (UZMC).

Argentina: Formosa, 1 ♂ Gran Guardia, Jan. 1953 (ML). — Misiones Terr., 1 ♀ Posadas, 13—15 Febr. 1927, F. & M. Edwards (BM). — N. Argentina, 1 ♂ Chaco de Santiago, leg. Wagner (NRS); 3 ♀ Tucuman, coll. Wüstnei (UZMC). — La Rioja, series Patquia (BM). — Santa Fé, Rio San Javier, G. E. Bryant (BM, 1912-268). — Cordoba, 1 ♀ leg. Dohrn (ML). — Mendoza, 1 ♂ Mendoza, March 1946, coll. Mauzoner (ML), 3 ♀ do., 13 March 1908, P. Jörgensen (UZMC), 1 ♂ do., 8 April 1908, Jensen-Haarup (UZMC), 4 ♀ 7 ♂ Est. Pedregal, Jensen-Haarup (UZMC, 2 ♀ 2 ♂ ML); 2 ♀ 5 ♂ Chacras de Coria, Febr.-April 1907 and Jan.-Febr. 1908, P. Jörgensen (UZMC), series San Rafael (MP), 1 ♀ Potrerillos, 6 Jan. 1927, F. & M. Edwards (BM). — Buenos Aires, 2 ♀ delta of Paraná near Buenos Aires, Febr. 1929, Lt. C. Morley Knight (BM, ML); 1 ♀ 1 ♂ Rio de la Plata, coll. Schiödte, 1 ♀ 1 ♂ do., coll. Westermann, 1 ♂ do., coll. Drewsen (UZMC).

Sceliphron asiaticum chilense (Spinola)

Pelopoeus chilensis Spinola, 1851, in Gay, Hist. fis. Chile, Zool. 6: 395, ♂ ♀ — Chile (?MT).
Sceliphron (*Pelopoeus*) *figulus* var. *chilense*; Kohl, 1918, Annln naturh. Mus. Wien 32: 48, 120.

Chile: 2 ♀ "Chile" (BM 86-28); 1 ♀ 1 ♂ "Chile", Reed (OUM); 2 ♀ 1 ♂ "Chile", Dr. E. P. Reed (BM); 1 ♂ "Chili", coll. Drewsen (UZMC); 1 ♀ Valparaiso, Dr. F. Reed (ML); 1 ♀ do., Galatea (UZMC); 1 ♀ 1 ♂ Santiago, 1923, Father Claude-Joseph (USNM); 1 ♂ do., 27 Dec. 1923, A. Faz (ML); 1 ♀ Rancagua, Dec. 1904, P. Herbst (MBUD); 3 ♀ 1 ♂ Cauquénes, Febr. 1899, Schoenemann (ZMB).
Argentina: 1 ♀ Mendoza, March 1946, coll. Manzoner (ML); 1 ♀ prov. Neuquen, Junin de los Andes, 19 Jan. 1955, "on mud nest below window-sill", J. B. Ricketts (BM).

Sceliphron (Sceliphron) fasciatum (Lepeletier)

Pelopoeus fasciatus Lepeletier, 1845, Hist. Nat. Ins. Hym. 3: 315, ♀ — "Sans patrie", coll. Serville (MT).
Sceliphron fasciatum; ?Ashmead, 1900, Trans. R. ent. Soc. Lond. 1900: 229 (St. Vincent, 6 ♀ 4 ♂); Schulz, 1903, Sber. bayer. Akad. Wiss. 1903: 470, Pl. Fig. 4 (Haiti) [overlooked by Kohl, 1918].
Sceliphron (*Pelopoeus*) *argentifrons*; Kohl, 1918, Annln naturh. Mus. Wien 32: 112 [pro parte].
Sceliphron fasciatum; Porter, 1926, Proc. U. S. nation. Mus. 70: 16 ("Isle of Pines, Haiti and Cuba") [pro parte!].

Both Kohl (1918) and Porter (1926) failed to discover that the Antillean islands are inhabited by two very similar black-legged species of *Sceliphron*. Kohl recorded them together under the name *argentifrons*, and deliberately avoided the use of Lepeletier's older name *fasciatum*, because his specimens did not agree in all respects with this author's description. Both Ashmead and Porter treated *argentifrons* as a synonym of *fasciatum*, apparently without having seen the type of the latter species.

After we had found that two species are involved, it became particularly important to determine the identity of *Pelopoeus fasciatus* Lepeletier. The type is preserved in the Spinola collection of the "Istituto e Museo di Zoologià dell' Universita" at Turin. Fortunately, upon our request, one of the scientists of this Institute, Dr. U. Parenti, kindly compared this specimen with some sketches and notes indicating the differences between the two species. He was thus able to ascertain that *Sc. fasciatum* and *Sc. argentifrons* are not identical.

Hispaniola: Dominican Republic, 6 ♀ 4 ♂ Haina and La Romana, pres. by Imp. Inst. Ent. (BM, 1930-336; 1 ♀ 1 ♂ ML); 1 ♀ "S. Domingo", received about 1840 from Mus. Berlin (ML); 1 ♀ "S. Domingo" (NMW). — Haiti, 1 ♀ Mt. Rouis, 14 Aug. 1934, M. Bates (MCZ); 4 ♀ swamps of Dessalines, 11 Sept. 1934, M. Bates (MCZ; 1 ♀ ML); 2 ♀ Port au Prince & vic., 3 Oct. 1934, Darlington (MCZ).
Guadeloupe: 2 ♀ leg. Gourbeyre, June-July 1952, L. Berland (MP; "*argentifrons* det. Berland").
St. Vincent: apparently the species has not been collected here since it was recorded by Ashmead (1900). This record was almost certainly incorrect; see p. 254.
Two females from "Cuba" (NMW), both with illegible collector's label (?"Aithr"), are almost certainly incorrectly labelled.

Sceliphron (Sceliphron) argentifrons (Cresson)

Pelopoeus argentifrons Cresson, 1865, Proc. ent. Soc. Philadelphia 4: 136 — "Cuba" (1 ♀ coll. Ent. Soc. Philad.).

Sceliphron argentifrons; Kohl, 1918, Annln naturh. Mus. Wien 32: 112, ♀ ♂ [pro parte!].

Sceliphron fasciatum; Porter, 1926, Proc. U. S. nation. Mus. 70: 16 (syn.: *Sc. argentifrons* Cresson) [pro parte!].

The characters distinguishing this species from the similar inhabitant of the islands of Hispaniola and Guadeloupe are enumerated in the key. The distribution and ethology of both these species deserve further study.

Cuba: 3 ♀ "Havane, '64", leg. Poey, coll. Sichel (MP); 1 ♀ 1 ♂ Guantanamo, H. Rolle (NMW); 1 ♀ "Cuba, Richt", G. Mayr, 1870 (NMW); 1 ♀ "Cuba, Wthm" (NMW); 3 ♀ "Cuba", Ch. Wright (MCZ, 1 ♀ ML); 1 ♀ Isla de Pinos, 5 June 1913, R. Oertel (MCZ); 2 ♀ Vilches Potrero, Soledad, Cienfuegos, 19 Aug. 1930, Richard Dow (MCZ).

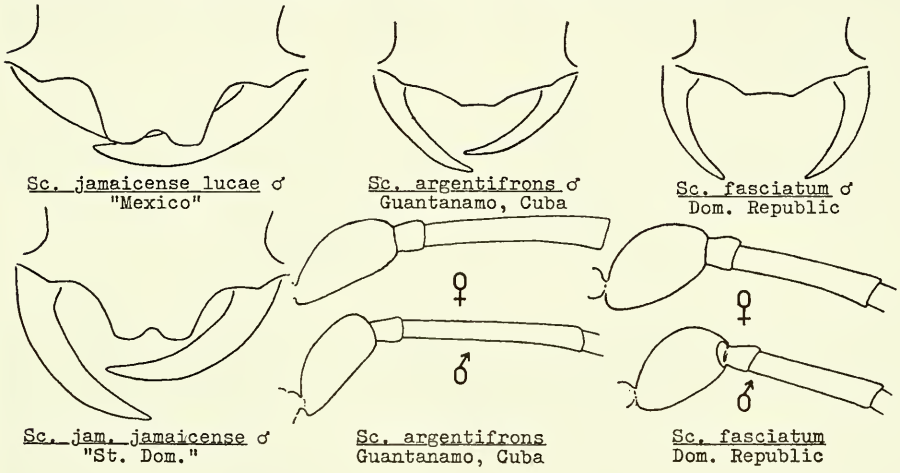


Fig. 18. Central American species: anterior part of clypeus, with mandibles, and antennal segments 1—3

Sceliphron (Sceliphron) jamaicense jamaicense (Fabricius)

Sphex jamaicensis Fabricius, 1775, Syst. Entom.: 347 — "Jamaica" (type lost?).

Sphex iamaicensis [!]; Fabricius, 1781, Spec. Insect. 1: 444.

Pelopoeus annulatus (Klug MSS.) Cresson, 1865, Proc. ent. Soc. Philadelphia 4: 135, ♀ ♂ — "Cuba" (types, 1 ♀ 2 ♂, coll. Ent. Soc. Philadelphia).

Sceliphron (*Pelopoeus*) *jamaicense*; Kohl, 1918, Annln naturh. Mus. Wien 32: 114 (Cuba; Jamaica; Haiti).

Sceliphron jamaicensis; Porter, 1926, Proc. U. S. nation. Mus. 70: 5, 17 (Haiti; Bahamas; Cuba; Jamaica).

Sceliphron jamaicense; Krombein, 1953, Am. Mus. Novit. 1633: 17 (5 ♀ Bimini, South Bahamas).

Cuba: 12 ♀ 4 ♂ Guantanamo, from H. Rolle (NMW; 1 ♀ 1 ♂ ML); 1 ♀ from unknown locality, from Monchicourt, is perhaps from Cuba (ML); 1 ♀ Guaro Oriente (MCZ); 1 ♀ Preston Oriente, Corua (MCZ); 1 ♀ Jobabo, "I-21-25, TPRF, Ent. no. 82", C. F. Stahl (MCZ); 1 ♀ "Cuba", Dohrn (NRS).

Jamaica: 2 ♀ Jamaica (BM, 47-62); 1 ♀ Jamaica (BM, 45-110).
Hispaniola: 1 ♀ "St. Dom." (BM, 55-1), 1 ♂ "St. Dom.", coll. Saunders (OUM); 1 ♀ S. Domingo, S. Henshaw, acc. no. 3668 (MCZ); 1 ♀ San José de las Matas, Dom. Rep., 1000—2000 ft., June 1938, Darlington (MCZ).
Bahamas: 1 ♀ Simon's, Long Island, July; 1 ♀ Nassau, XI; 2 ♀ Nassau, New Providence, 28 June 1904, Allen, Barbour and Bryant; 1 ♀ 1 ♂ Cat Island, Arthurs Town, July-Aug. 1935, W. J. Clench (all MCZ).

Sceliphron (Sceliphron) jamaicense lucae (Saussure)

Pelopoeus lucae Saussure, 1867, Reise Novara, Zool. 2 (1): 30, ♀ ♂ — "California inferior; Promontorium St. Lucae" (? location of type).
Sceliphron lucae; Porter, 1926, Proc. U. S. nation. Mus. 70: 19 ("California; Lower California"); Bohart and Menke, 1963, Univ. of Calif. Publ. Ent. 30: 117 ("southern part of Baja California").

This form is so similar to typical *Sc. jamaicense* that we have decided to reduce it to subspecific status. The characteristic shape of the clypeus of the male is very similar in the two forms (Fig. 18), and a comparison of the male genitalia has shown that these agree in all details.
The gastral petiole varies from brownish yellow to dark brown.

Lower California: 2 ♀ "Basse Calif.", Diguet, 178-95 (MP); 2 ♀ 2 ♂ Cap St. Lucas, Sichel, with label "*dispar* Sichel" (MP).
Mexico: 3 ♀ 2 ♂ Etat de Jalisco, environs de Guadalajara, 1903, L. Diguet (MP).

B. Group of Sceliphron spirifex (L.)

Male genitalia: Fig. 20—22, 25 and 26; pubescence of parameres short in *arabs* and *hemipterum*, with a varying number of long hairs in the other species; the row of teeth on the distal part of the aedeagus most distinct in *arabs* and *fistularium*, more or less reduced in the other species; apex of aedeagus truncate in *hemipterum* and *destillatorium*, roundly truncate in *fistularium*, and produced into a lateral tooth in the other species, in *spirifex* with a distinct tubercle just below the tooth; volsellar lamina on inner side produced into a bluntly rounded tooth in *spirifex*, *javanum*, and *laetum*, not or only slightly projecting there in the other species; pubescence of cuspis usually short, partly moderately long in *arabs*, and very long and dense in *spirifex* and *javanum*; volsellar digitus with short pubescence, its shape generally characteristic for the species, although subject to a certain degree of intra-specific variation (Fig. 25).
It is noteworthy that *Sc. arabs*, which in the female sex agrees with the *madraspatanum*-group in having a tooth on the inner side of the mandibles, also shows affinities with this group in the characters of the male genitalia (pubescence of parameres, teeth on aedeagus, shape of volsellar digitus).

Key to the species of the *spirifex*-group

1. Mandibles of ♀ simple, without tooth on inner side. Mesoscutum and scutellum normal 2
— Mandibles of ♀ with distinct tooth on inner side. Mesoscutum with three longitudinal furrows, the median furrow short and shallow, the lateral furrows deeper and

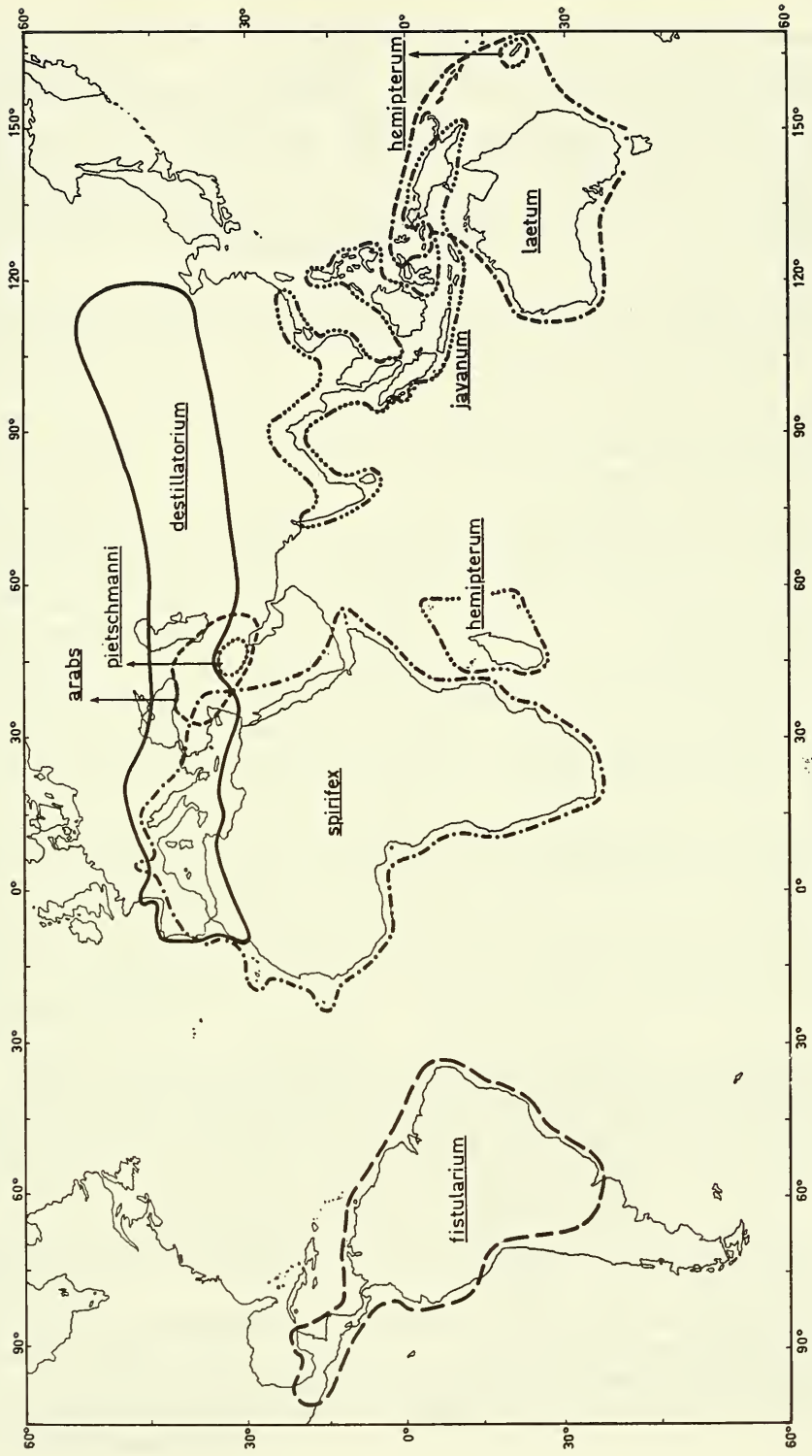


Fig. 19. Approximate distribution of the species of the *spirifex*-group

meeting posteriorly in front of the scutellum. Scutellum bituberculate; postscutellum convex, with weak median impression. — S.W. Asia . . . . *arabs* (Lepeletier)

2. Mesoscutum anteriorly transversely striate, posteriorly longitudinally striate, the striae fairly sharp, the interspaces not punctate. Second submarginal cell sometimes (?often) anteriorly slightly wider than the third (scutellum and postscutellum yellow). — S.W. Asia . . . . . *pietschmanni* (Kohl)

— Mesoscutum more or less distinctly striate, but the striae not very sharply defined and the interspaces distinctly punctate. Second submarginal cell anteriorly as a rule narrower than the third 3

3. Thorax and legs without yellow markings. Sides of thorax partly dark brownish red. — Madagascar and neighbouring islands; New Caledonia. *hemipterum* (Fabricius)

— At least the legs marked with yellow 4

4. Tegulae and usually also the postscutellum marked with yellow 5

— Tegulae and postscutellum black. Gastral petiole as long as the hind tibiae, or a little shorter or longer 7

5. Gastral petiole relatively short, only about 4/5—5/6 of the length of the hind tibia. Mesepisternum, propodeum, first gastral tergite and hind coxae black. Appressed pubescence (tomentum) of face silvery. Striation of sides of propodeum moderately coarse, the grooves between the ridges distinctly punctate. — Mediterranean through Asia to China . . . . . *destillatorium* (Illiger)

— Gastral petiole about as long as the hind tibia or slightly longer. Mesepisternum with yellow or orange-yellow mark beneath the tegula; propodeum usually marked with yellow at apex; first gastral tergite and hind coxae marked with yellow. Face with golden tomentum. Striation of sides of propodeum coarser; the grooves between the ridges very finely longitudinally rugose, not punctate 6

6. Propodeum separated from the metapleura by a deep groove. First antennal segment yellow; the other segments black. Prothorax on each side with yellow spot. Propodeum on each side with three yellow spots: one laterally at base, one on the dorsal area, and one at apex. Gastral petiole thin, black with narrow yellow line on upper and under side. Hind legs black, with yellow spots on upper and under side of coxae and yellow line on outer side of femora. — South America . . . . . *fistularium* (Dahlbom)

— Propodeum and metapleura separated by a distinct groove at apex only. Antennal segments 1 and 2 yellow, 3—6 or 3—7 yellow to ferruginous, more or less extensively brownish to blackish on outer side. Prothorax without lateral yellow spot. Propodeum with a single yellow mark at apex only (sometimes reduced or absent). Gastral petiole orange-yellow, sometimes more or less infuscated. Hind legs with at least the trochanters, the basal two thirds of the tibiae and the tarsal segments 1—4 yellow to ferruginous (metatarsus blackish at base); extent of yellow or ferruginous at base of hind femora variable. — Australia; New Guinea and neighbouring islands; Celebes . . . . . *laetum* (Smith)

7. Basal part of hind tibiae and hind femora yellow, the apical part black (Fig. 23). — S. Europe; S.W. Asia; Africa . . . . . *spirifex* (Linnaeus)

— Hind tibiae either entirely black or yellow to yellowish brown; hind femora variable (Fig. 23 and 27). — S.E. Asia; New Guinea, not in Celebes and Moluccas . . . . . *javanum* (Lepeletier)

Sceliphron (Sceliphron) arabs (Lepeletier)

Pelopoeus arabs Lepeletier, 1845, Hist. Nat. Ins. Hym. 3: 309, ♂ — "Arabie", coll. Serville (MP!).

Pelopoeus caucasicus E. André, 1888, Spéc. Hym. Europe 3: 109, ♀, Pl. VII Fig. 3, 5, 9 — "Caucase" (coll. André).

Sceliphron (*Pelopoeus*) *caucasicum*; Kohl, 1918, Annln naturh. Mus. Wien 32: 90, ♀ ♂.

Sceliphron (*Pelopoeus*) *arabs*; Kohl, 1918, Annln naturh. Mus. Wien 32: 132 (unidentified species; "vielleicht eine Abänderung des *Sc. madraspatanum*").

This remarkable species is transitional between the groups of *madraspatanum* and *spirifex*, having a tooth on the inner side of the mandibles as well as angular hind coxae. As noted above, certain characters of the male genitalia confirm that this species occupies an intermediate position.

As the lectotype the senior author has selected a male in the Paris Museum; it bears an old label "Arabie", but this has evidently been misread by somebody who put a printed label "Mus. Paris, Grèce, Ile d'Eubée" on the pin and this may be the reason why the specimen has not been recognized as a type. According to information received from Prof. L. Pardi there is no typical material of this species in the Spinola collection in Turin. The specimen in Paris agrees well with the description; the pubescence of the head is rather dirty and this may explain why Lepeletier wrote "Caput... nigro pilosum". Kohl has suggested that *P. arabs* Lep. might be a variety of *Sc. madraspatanum*, but we do not know a form of this species with the colour pattern described by Lepeletier. In the British Museum this species was correctly identified as *arabs* Lepeletier.

Turkey: 3 ♂ Turkey (BM, 50-105); 1 ♂ Adana, from Rolle, Berlin (NMW); 1 ♂ Kozan, 26 June 1955, Erich Schmidt (coll. de Beaumont); 1 ♀ Diyarbekir, 2 July 1937, leg. Ramme (ZMB); 2 ♀ Diyarbekir, July 1937 (MBUD; ML); 1 ♂ Amanus "C. D. 1891", coll. de Gaulle (MP).

U. S. S. R.: Azerbaydzhan, 2 ♂ Yevlakh ("Jewlach, Transkaukasus"), 1886 (NMW).

Syria: 1 ♀ Nahr Kuwaik near Aleppo, 27 May 1952, Erich Schmidt (coll. de Beaumont); 3 ♀ Akbes, coll. de Gaulle (MP).

Iraq: 1 ♀ Baghdad, 1913, Mattanovich (MBUD); 2 ♀ Baghdad, May-July 1922, Maj. J. E. M. Boyd (BM).

Iran: 1 ♀ S.W. Persia, Escalera (BM, 1900-61); 1 ♀ Kut, May 1918, Maj. T. D. Broughton (BM); 1 ♀ Bushire (= Bushehr) (ETHZ); 8 ♀ Fez Charab, 31 July 1910, Mesopot. Expedition (NMW; 1 ♀ ML).

In the British Museum the senior author saw a specimen labelled "Tenasserim, Moulmein, Bingham coll.", and Kohl (1918) reports that the Mus. Berlin possesses specimens from this same collection which are said to come from Sikkim and Burma; we agree with him, however, that the occurrence in these areas needs confirmation.

Sceliphron (Sceliphron) pietschmanni Kohl

Sceliphron (*Pelopoeus*) *pietschmanni* Kohl, 1918, Annln naturh. Mus. Wien 32: 15, 91, ♀ — Hsitsche, Mesopotamia, leg. Pietschmann, 1910 (1 ♀, NMW!).

This species has the rich colour pattern of *Sc. arabs* (Lepeletier), but differs in having no tooth on the inner side of the mandibles; the postscutellum is marked with yellow.

Prof. de Beaumont kindly sent us a female specimen, collected at Abu Ghuraib in Iraq, 31 July 1944, by A. T. Meymarian; we noted that it is closely related to *Sc. spirifex*, but that it differs as follows.

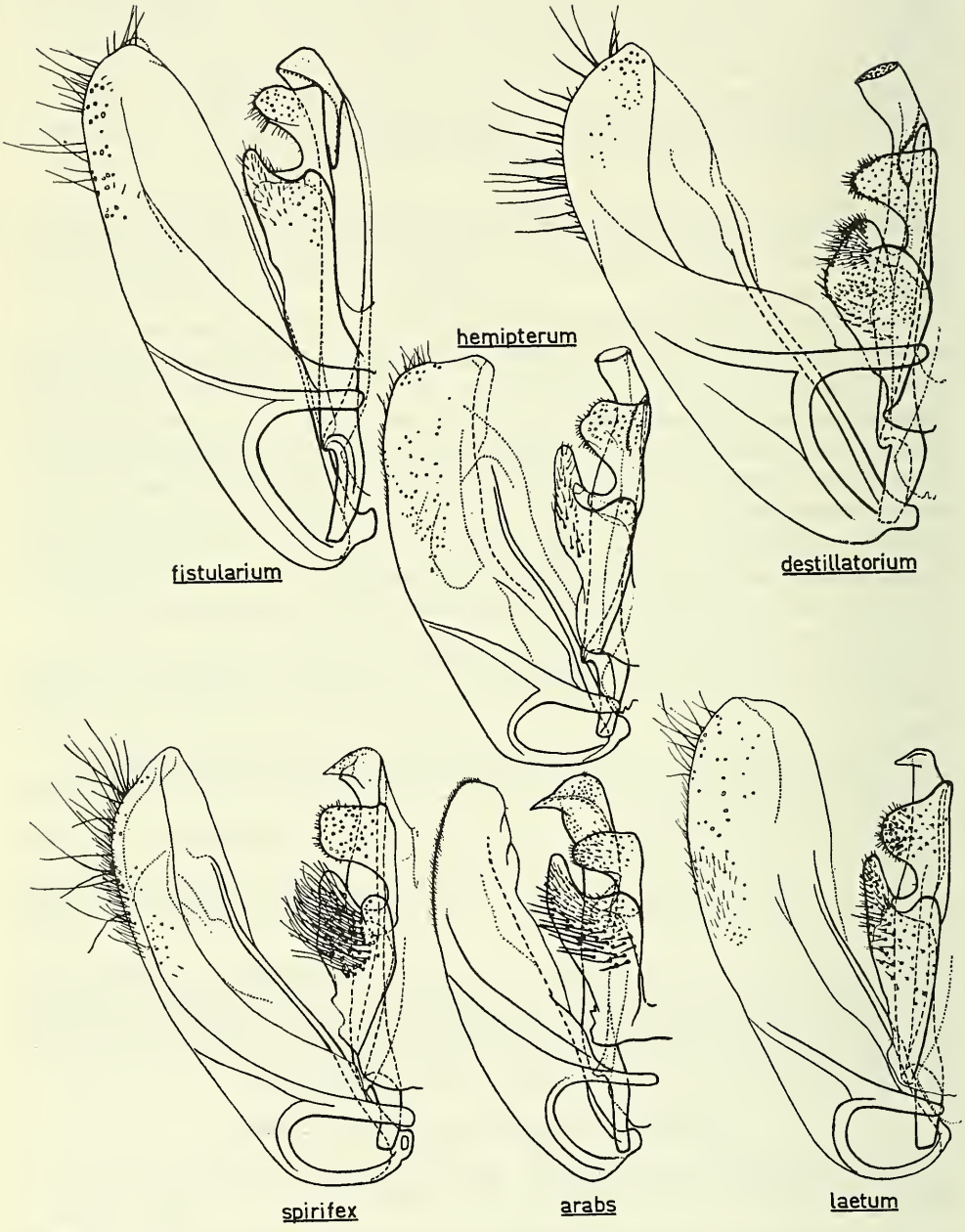


Fig. 20. Ventral view of male genitalia of species of the *spirifex*-group

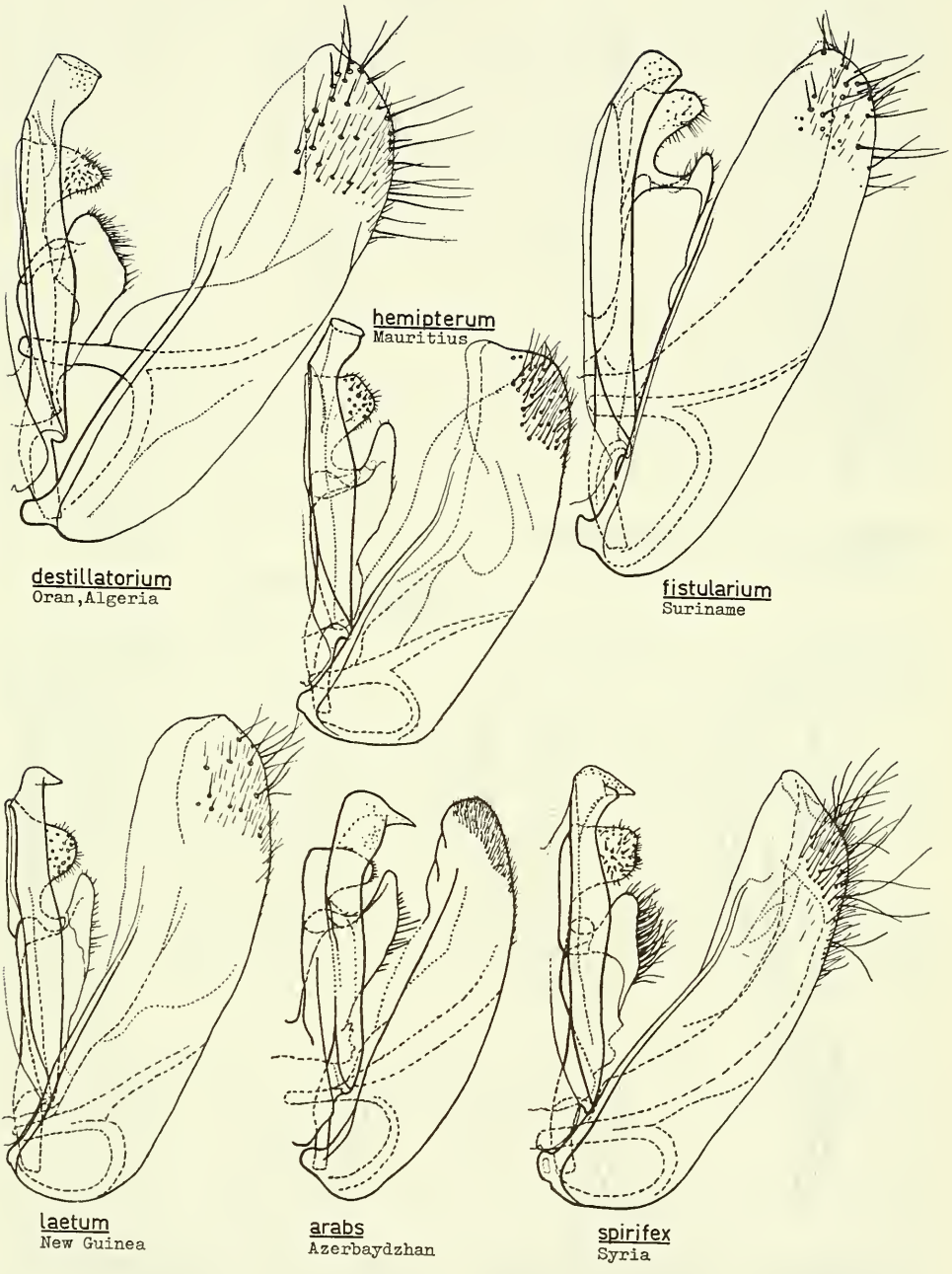


Fig. 21. Dorsal view of male genitalia of species of the *spirifex*-group

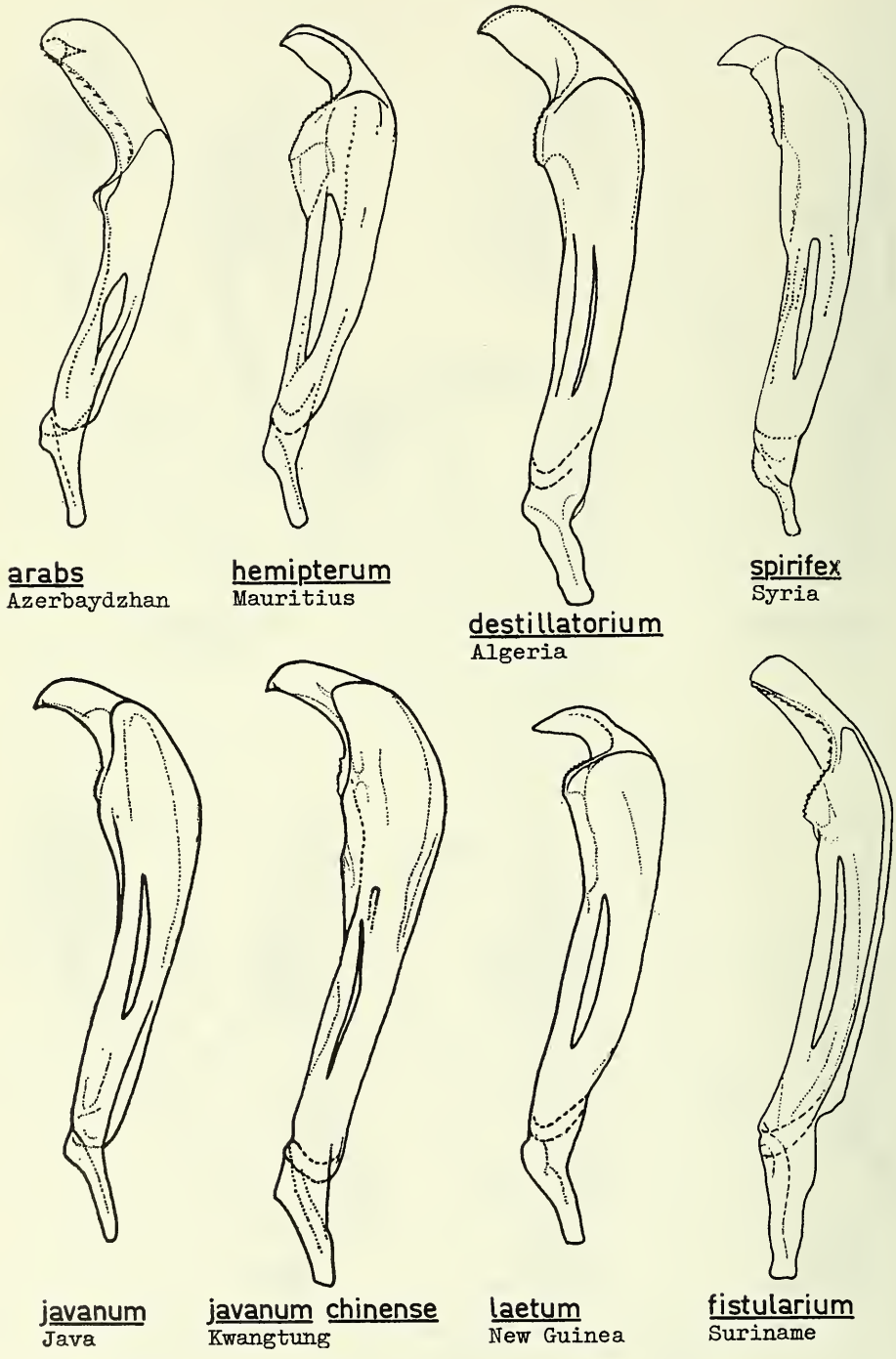


Fig. 22. Inner side of left half of aedeagus of species of the *spirifex*-group

Thorax more elongate; length (from anterior vertical surface of pronotum to apex of propodeum) more than twice the distance between the outer margins of the tegulae (27 : 13); mesoscutum sharply striate, without punctures between the striae; thorax rather sparsely pubescent; second submarginal cell anteriorly slightly wider than the third; both cells rather strongly narrowed anteriorly (second cell width at base and at top 44 : 23 in left wing, 45 : 21 in right wing; third cell 37 : 20).

Some further notes on this specimen: interocular distance on vertex smaller than at the clypeus (25 : 31), antennal segments 3 : 4 = 25 : 20, length of gastral petiole = 83. Posterior ocelli as far from the eyes as from each other.

Femora I orange yellow with dark base, on femora II the dark colour extends a little beyond the middle, the outer third of femora III is black, not very sharply defined; all tibiae yellow, but tibiae II slightly infuscated near apex and tibiae III with irregularly defined dark ring on apical fourth; tarsi dark, except for the hind metatarsus, which is yellow with narrow dark ring at base and apex. Markings of antennae and thorax as described by Kohl (1918), but tegulae brownish on slightly less than the posterior half.

In a female from Baghdad, 1913, Mattanovich (MBUD), the second submarginal cell is slightly narrower anteriorly than the third (24 : 25 in left wing, 22 : 25 in right wing); otherwise this specimen agrees well with the one described above.

This is the only species in the subgenus *Sceliphron* of which the male is yet unknown.

Sceliphron (Sceliphron) hemipterum (Fabricius)

"Guêpe ichneumon", Réaumur, 1742, Mém. Hist. Ins. 6: 279, Pl. 28 Fig. 7 — Isle de France, leg. Cossigny [notes on bionomics].

Sphex hemiptera Fabricius, 1798, Entom. System., Suppl.: 244 — "Isle de France", coll. Bosc (MP!).

Sceliphron fuscum Klug, 1801, Neue Schrift. Ges. Naturf. Fr. Berlin 3: 566.

?*Pelopoeus fuscus* Lepeletier, 1845, Hist. Nat. Ins. Hym. 3: 311, ♀ — "Sans patrie", coll. Serville (location of type?) [invalid secondary homonym of *Sceliphron fuscum* Klug, 1801].

Sceliphron quodi Vachal, 1907, Rev. Ent. Caen 26: 144, ♀ — New Caledonia (MP!); Kohl, 1918, Annln naturh. Mus. Wien 32: 138 (unidentified species).

Sceliphron (*Pelopoeus*) *hemipterum*; Kohl, 1918, Annln naturh. Mus. Wien 32: 108.

The type of *Sphex hemiptera* F. is in the general collection of the Paris Museum; this collection also contains the types, a female and a male, of *Sceliphron quodi* Vachal. Very probably this species has been transported by French ships from Madagascar to New Caledonia.

Seychelles: series in NMW; 1 ♀ Mahé, Jan. 1953, E. S. Brown (*Sc. quodi* Vachal det. Nixon, pres. by C.I.E., 1954-113, BM); series from Mahé in MP.

Aldabra Is.: 1 ♂ June-July 1916, P. R. Dupont (BM).

Comoren Is.: 1 ♀ Johanna I., 77—58 (BM).

Nossi-Bé: series in NMW.

Madagascar: series in BM, MP, NMW; 1 ♀ Tamatave (NRS). — According to a note by Seyrig in MP, this species preys on Thomisidae, Argiopidae, Salticidae, etc.

Mascarene Is.: Mauritius, 1 ♀ 48—53, 1 ♀ 57—53, 1 ♀ 57—140; 1 ♀ 9 Nov. 1905, 1 ♂ 6 Febr. 1906, N. Manders (1915-147), all in BM; 1 ♀ Mauritius, Monchicourt (compared by the senior author with Fabrician specimen in Mus. Copenhagen, Aug. 1959); 3 ♀ Mauritius, from Mus. Berlin (ML); 2 ♀ "Isle de France" (= Mauritius), coll. Westermann (UZMC); 1 ♀ do., coll. Drewsen, 1 ♀ do., coll. Colsm. (UZMC); 1 ♂ Réunion, Poller (ML); series from Mauritius and Réunion (MP).

New Caledonia: 1 ♀ 1 ♂, types of *Sc. quodi* (MP); 3 ♀ Noumea (BM).

Sceliphron (Sceliphron) destillatorium (Illiger)

Ichneumon XVII, Schaeffer, 1766, Icon. Insect., I, Pl. 38 Fig. 1.
Sphex destillatoria Illiger, 1807, in: Rossi, Fauna Etrusca, 2nd. ed., 2: 94 — Italy.
Sphex pensilis Illiger, 1807, in: Rossi, Fauna Etrusca, 2nd. ed., 2: 94 — Italy.
Pelopoeus sardonius Lepeletier, 1845, Hist. Nat. Ins. Hym. 3: 308, ♀ — Sardinia, coll. Lepeletier (?MP).
Pelopoeus sardous Carruccio, 1872, Bull. Soc. Ent. Ital. 4: 275 [emendation of *P. sardonius* Lep.] [not in Kohl, 1918].
Pelopoeus pensilis var. *trinacriensis* Destefani, 1889, Naturalista Siciliano 8: 269 — Sicily [variety with entirely black gastral petiole].
Sceliphron (*Pelopoeus*) *destillatorium*; Kohl, 1918, Annln naturh. Mus. Wien 32: 100; Leclercq, 1955, Expl. Parc Nation. Upemba, Mission G. F. de Witte, etc. 34: 63.

This species is common and widely distributed in the Mediterranean subregion, and goes eastward through Central Asia to Tientsin (Fig. 19). It is represented from the Mediterranean area by good series in the museum collections in Copenhagen, London, Paris, and Vienna, and it seems hardly necessary to give a detailed list of locality records. We have therefore restricted the data to some borderline localities, to the localities in Asia and to those of the specimens in the Leiden Museum.

Material in the Leiden Museum. — S. France, 1 ♂ Vernets les Bains, Pyr. Or., Aug. 1896, C. Ritsema Czn; Spain, series from La Carolina, 700 m (Jaen), La Aliseda, 1000 m (Avila), and Tornavacas, 1200 m (Caceres), June 1961, 1 ♀ on *Mentha pulegium* L., 1 ♀ 4 ♂ on *Thapsia villosa*, Exc. Mus. Leiden; 3 ♀ Cadaqués, July 1961, L. B. Holthuis; Italy, 1 ♀ Passerini, 2 ♂ leg. Calkoen, 1 ♂ leg. Zeller; Dalmatia, 2 ♀ leg. Cantraine; Greece, 2 ♀ Portaria Pelionpass and Pentalophon, July 1963; Crete, 1 ♂ Knossos, 1 June 1966, J. van der Vecht; Morocco, 2 ♀ P. Lyautey and Ain Diab, Casablanca, June 1950, P. M. F. Verhoeff; Algeria, 2 ♀ Oran, leg. F. Ancey, 1 ♂ "Algeria", leg. Richter; Syria, 1 ♀ 1 ♂ Beyruth; Tschardschui, 1 ♀ leg. G. von Rennenkampf.
Further material examined. — Specimens from Gibraltar, Malta, Sicily, Crete, Cyprus, and Turkey (BM), from Sicily and Crete also in ZMB; Morocco, 1 ♂ Asni, Aug. 1930, T. D. A. and W. P. Cockerell (BM), 1 ♀ Haut Atlas, Jb. Ayachi, Tizi-n-Zou, 3 Aug. 1963, A. C. Pont (BM); 1 ♀ Bozen, July 1935, S. L. Tuxen (UZMC); 1 ♂ Klausen, S. Tirol, 1910, W. Ramme (ZMB); 1 ♀ Csehtelek, Bihar 46° N, 22° E, June 1910 (BM); 1 ♀ Moldavia, Berlad valley, leg. Montandon, coll. E. Saunders (BM); Iran, 1 ♀ Zabidan (Belut), in garden, 13 May 1954, P. Aellen (NMB); 1 ♀ Kaschgar, Raquette, 1 ♀ Sinkiang, Jarkent (NRS); 1 ♀ Songaria, Ala Tau (UZMC); 4 ♀ 2 ♂ Tientsin, 15 June 1906, F. M. Thomson (BM); 1 ♀ 1 ♂ do., on *Zizyphus jujuba*, June 1928, H. T. Feng (petiole of ♂ nearly entirely black) (USNM); 1 ♀ Woo-Fu, 21 June 1928 (CU). — Recently a single specimen has been found near Lublin in Poland (information received from Dr. W. J. Pulawski).

Sceliphron (Sceliphron) spirifex (Linné)

Sphex spirifex Linné, 1758, Syst. Nat., 10th ed.: 570 — "in Europa australi".
Sphex aegyptia Linné, 1758, Syst. Nat., 10th ed.: 569 — "in Aegypto".
Sphex spirifex atra Scopoli, 1786, Delic. faun. et flor. Insubr. I: 57, Pl. 23 Figs. 1 a-e,, 2A — Italy.
Sceliphron (*Pelopoeus*) *spirifex*; Kohl, 1918, Annln naturh. Mus. Wien 32: 86; Leclercq, 1955, Expl. Parc Nation. Upemba, Mission G. F. de Witte, etc. 34: 60.

Sceliphron spirifex occurs throughout Africa and Southern Europe and appears to be common almost everywhere in this extensive area (Fig. 19). It is represented by numerous specimens from the Ethiopian region and the Mediterranean subregion in all the larger European museums and we have therefore refrained from adding further localities to the long lists of records given by Kohl and by Leclercq.

An exception may be made for some island localities, not given by Kohl: Canary Is.: 2 ♂ Gran Canaria, leg. Duurlo (UZMC), 1 ♂ Las Palmas, 1926, leg. Hirtz (ZMB), 2 ♀ Teneriffe, S. Cruz, June 1926, leg. Liebe (ZMB); Cape Verde Is.: 1 ♀ S. Vicente, 8 Dec. 1945, Atlantide Exp. (UZMC); Fernando Po (BM). Furthermore some data on the northern and eastern limits of the area of distribution are of sufficient interest to be mentioned here: in France *S. spirifex* has been collected at Macon, 60 km North of Lyon (Berland, 1928), and at Carpentras (4 ♀ July 1951, P. M. F. Verhoeff; ML); for Italy Kohl (1918) gives "Trient in Tirol" as the northernmost locality; some marginal localities in eastern Europe are Tab (46°. 30′ N) in Hungary and Vsétin (49°. 20′ N) in Czechoslovakia (Zavadil and Snoflak, 1948). Eastward *S. spirifex* is said by Kohl (1918) to occur as far as Kisil near Kutschan, Bukhara, in Turkmenia (64° E), but this record (omitted in Fig. 19) seems to need confirmation.

Sceliphron (Sceliphron) javanum (Lepeletier, 1845) (Fig. 23—27)

This species is more widely distributed (Fig. 19, 24) than would appear from the records given in Kohl's paper (China, India and Ceylon to Borneo and Flores). *Sceliphron aemulum* Kohl from the Philippines is no more than a subspecies of *Sc. javanum*; furthermore there is a representative in the Papuan subregion, viz. *Sc. laboriosum* (Smith), a form which had remained unknown to Kohl.

Some remarkable aspects of the distribution of this polytypic species are: (1) the species is not represented in Celebes and the Moluccas; (2) the Papuan form seems to have reached its habitat via the Lesser Sunda Islands, but it is much more similar to the form inhabiting Flores and Sumba than to the subspecies occurring in Timor; (3) the marginal forms inhabiting Ceylon and Southern India, the Lesser Sunda Islands (except Timor) and the Papuan subregion (New Guinea, Aru Is.), are rather similar amongst each other and differ particularly from the central subspecies in the greater extension of the yellow colour on the hind legs (see Fig. 23); (4) the continental subspecies *chinense* and *petiolare*, and perhaps also *nalandicum*, are not sharply separated.

In certain large areas the distinguishing characters of the forms mentioned under (4) are constant enough, but elsewhere distinct signs of intergradation can be found. Further investigations in the areas where these subspecies meet are necessary for determining the extent of this phenomenon.

The various subspecies differ not only in colour pattern but also in the shape of the male genitalia (Fig. 25 and 26). Unfortunately the males of some subspecies have remained unknown to us.

Key to the subspecies of *Sceliphron javanum* (Lep.)

1. Hind tibiae black 2
— Hind tibiae yellow or brownish-yellow 6
2. Hind tarsal segments 1—3 yellow, fuscous at base and apex. Apical two thirds of femora I and apical half of femora II yellow. At least the apical third of the hind femora black, sharply separated from the basal yellow part. — Timor, Roti, ?Wetar. . . . . *timorense* van der Vecht
— Hind tarsal segments black 3
3. Hind femora yellow with usually ill-defined fuscous mark at apex above; if fuscous to black all round, the dark part is angularly produced on the inner side of the femur, and rarely covers more than the apical third on the outer side 4
— At least the apical third of the hind femora black, the dark part rather sharply separated from the basal yellow part 5

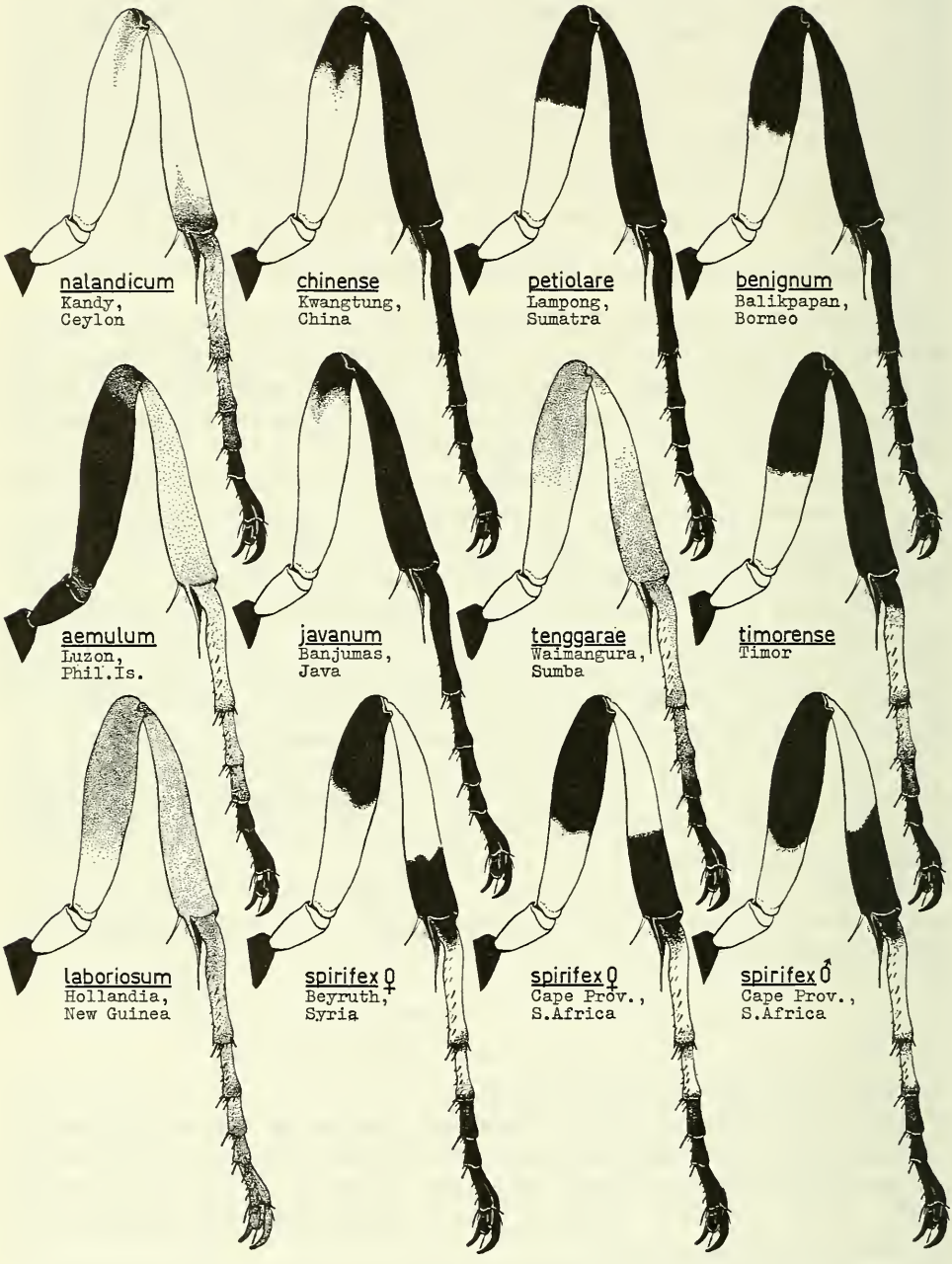


Fig. 23. Coloration of hind leg (♀) in the subspecies of *Sc. javanum* (Lep.) and in three specimens of *Sc. spirifex* (L.)

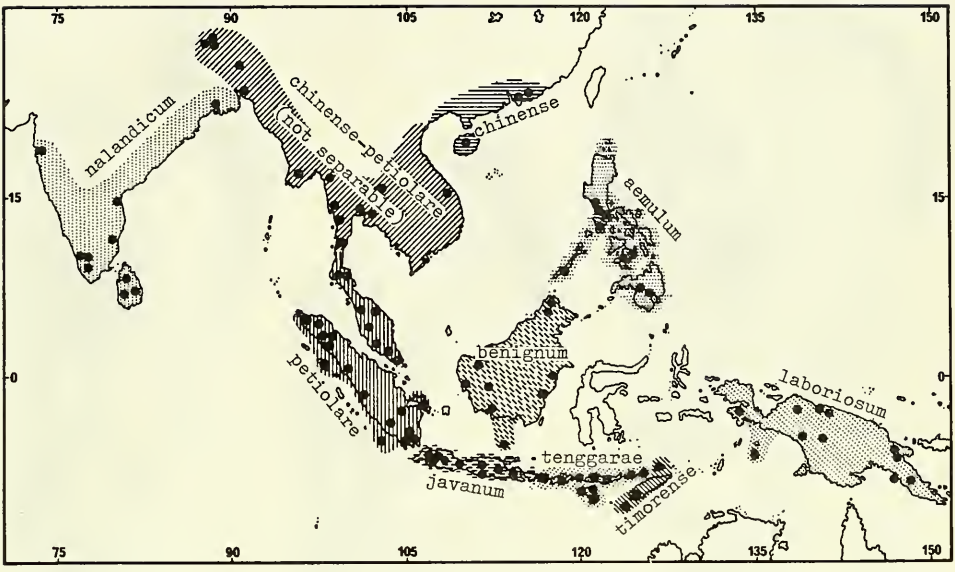


Fig. 24. Approximate distribution of the subspecies of *Sc. javanum* (Lep.)

4. Fore and mid femora black, brownish at apex; fore and mid tibiae orange-yellow to pale brown. — Java . . . . . *javanum* (Lep.)
— At least apical third of fore and mid femora yellow to yellowish-brown; fore and mid tibiae yellow. — China . . . . . *chinense* van Breugel subsp. nov.
5. Gastral petiole black. — Borneo and Bawean I. . . . . *benignum* Smith
— Gastral petiole yellow. — Sikkim, Burma, Thailand, Malaya, Sumatra, Banka, Enggano . . . . . *petiolare* Kohl
6. Hind trochanters and femora black, the latter brownish at apex and with an irregular and narrow brown ring at base. Gastral petiole dark brown to black. Antennal segments 1 and 2 mainly, and often the under side of 3, ferruginous. — Philippines. . . . . *aemulum* Kohl
— Hind trochanters and femora yellow or brownish, sometimes more or less fuscous. Gastral petiole yellow. Antennae black, with only the anterior surface of the first segment (scape) yellow or reddish 7
7. Hind femora yellow with very small fuscous mark at apex above. Apical tarsal segments fuscous to black. — Ceylon, S. India, Bengal . . . *nalandicum* Strand
— Hind femora yellow at base only, the remaining part more or less brownish . . 8
8. At least the apical two thirds of the hind femora brown, greater part of tibiae uniformly yellowish-brown. Hind tarsal segments yellowish-brown. Apical half of femora I and II yellow. — New Guinea, Aru Is. . . . . *laboriosum* (Smith)
— Apical half of hind femora and apical half of hind tibiae yellowish-brown to brown. Hind tarsal segments 3—5 fuscous to black. Femora I and II black with brownish apex. — Lesser Sunda Islands from Lombok to Alor or Wetar . . . . . *tenggarae* van der Vecht

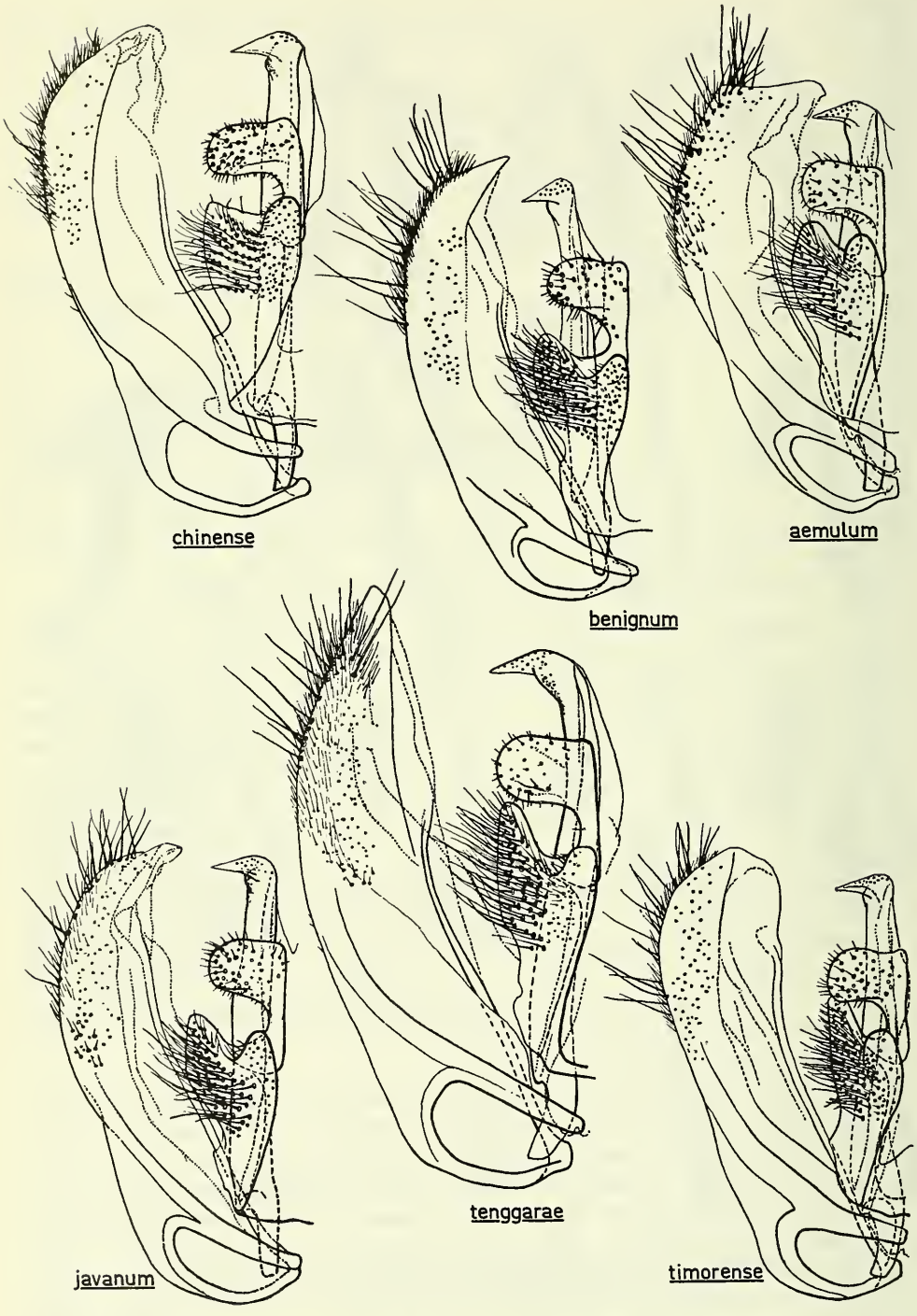


Fig. 25. Ventral view of male genitalia of six subspecies of *Sc. javanum* (Lep.)

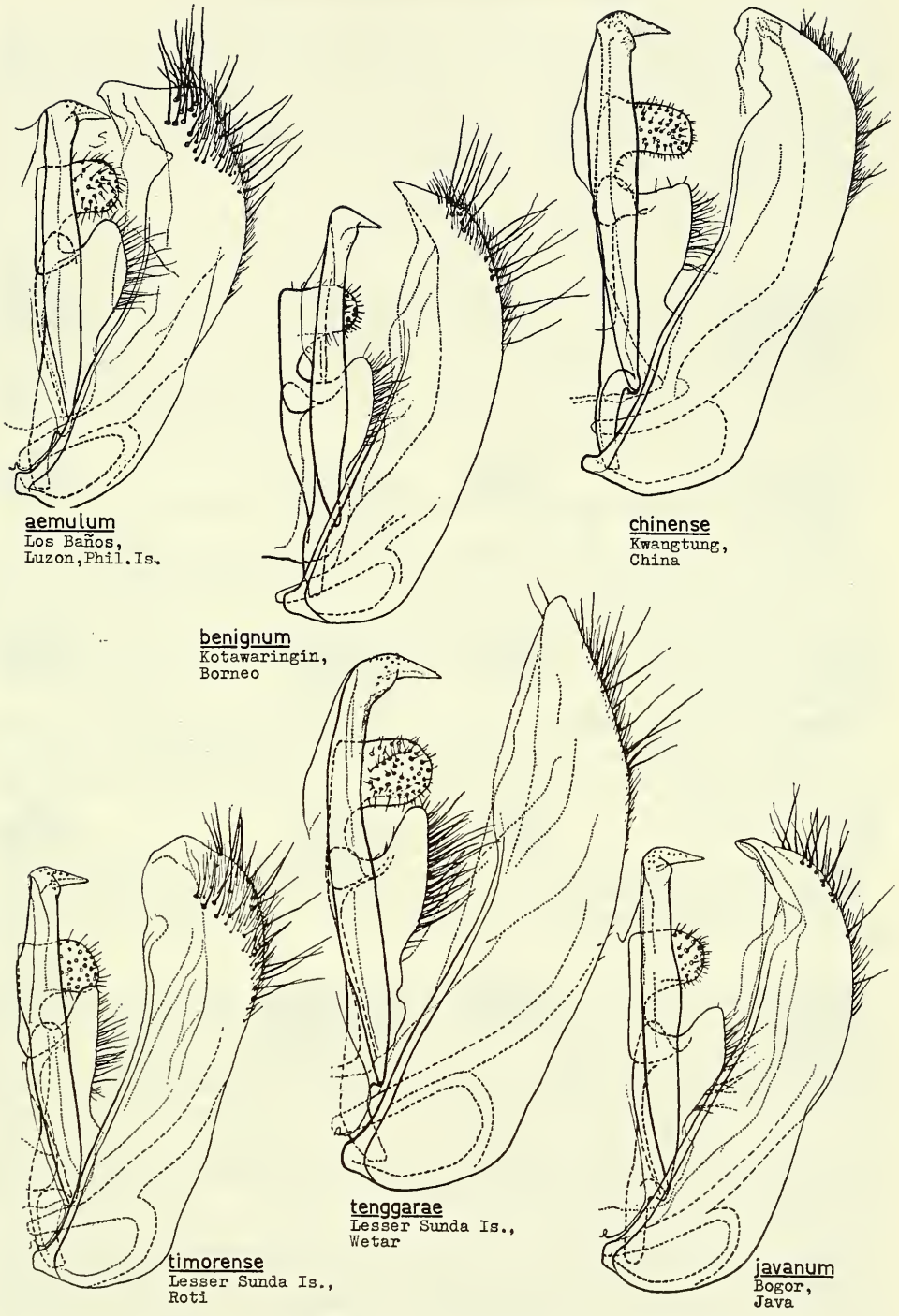


Fig. 26. Dorsal view of male genitalia of six subspecies of *Sc. javanum* (Lep.)

Sceliphron javanum nalandicum Strand

Pelopoeus spinolae; Smith, 1856, Cat. Hym. Brit. Mus. 4: 231 (Bombay; Ceylon) [misidentification of *P. spinolae* Lepeletier, 1845]. — Cameron, 1889, Mem. Manchr. lit. phil. Soc. (4) 2: 102 (cat.). — Bingham, 1897, Fauna Brit. India, Hym. 1: 237, ♀ ♂ (Ceylon; Southern India; Bombay; Bengal).

Sceliphron javanum var. *nalandicum* Strand, 1915, Arch. f. Naturgesch. 81A (5): 93, ♀ — "Nalanda und Kandy, Ceylon" (DEI). — Kohl, 1918, Annln naturh. Mus. Wien 32: 92, 93 (syn.: *Sc. spinolae* of Bingham).

Ceylon: 1 ♀ Peradeniya, Febr. 1902, 1 ♀ Henaratagoda, 19 Febr. 1902, Dr. Uzel, 2 ♀ Kandy, April and May 1902 (NMW); 1 ♀ Pundaloya, Green coll., "*Sc. spinolae* Lep. coll. Bingham, 96—30" (BM); 2 ♀ Sigiri, 1 ♀ Dambulla, 1 ♀ Matale, March 1910, E. Comber (BM); 1 ♀ "Ceylon", Felder (ML); 1 ♀ Kandy, 1 ♀ Peradeniya, both June 1953, 1 ♂ Puttalam, 23 Febr. 1954, F. Keiser (NMB; ML); 1 ♀ Colombo, 22 Febr. 1945, J. O. T. Howard (BM).

India: Western India, 1 ♀ Bombay, coll. C. G. Nurse, 1920-72 (BM). — Southern India, 4 ♀ 3 ♂ Coimbatore Distr., 1925, Col. Fraser (BM); 1 ♀ Coimbatore, April 1962, P. Susai Nathan (ML); 1 ♀ Malabar, coll. E. André (MP); 1 ♀ Nilgiri, Coonoor, M. Maindron (MP); 1 ♀ Mahé, Malabar coast, Maindron (MP). — Bengal, 1 ♀ "Bengale", Macé (MP); series from Barrackpore, coll. Rothney (OUM; identified as *intrudens* Sm. and *javanus* Lep.).

Sceliphron javanum chinense van Breugel subsp. nov.

♀ ♂ — Very similar to the subspecies *petiolare* and *javanum*, but differing by the greater extent of orange-yellow on fore and mid femora, which covers from 1/3 to 3/5 of the total length. The dark area at the apex of the hind femora is usually less extensive and less sharply defined than in subsp. *petiolare*, but larger than in subsp. *javanum*; on the inner side of the femur its irregular outline is more or less produced in the middle (Fig. 23 and 27).

The shape of the male genitalia (Fig. 25 and 26) supports the idea that the Chinese population(s) may be given separate subspecific status; the basal part of the volsella is more broadly truncate, and the digitus is longer and more slender than in the other subspecies of *javanum*.

China: prov. Kwantung, 3 ♂ Canton, 2 ♀ 1 ♂ Lo fao shan (1 ♀ 7 May, 1 ♀ 4 June '15), 2 ♀ Lung tao shan, 31 July and 4 Aug., 3 ♂ Mahn tsi shan, 14 and 15 May, 1 ♂ Ting wu shan, 16 May '16, all leg. Mell (paratypes, ZMB, 2 ♀ 2 ♂ ML). — Hainan Island, 1 ♀ Fan Heang, 20 June 1935, L. Gressitt (MCZ).

The following specimens are tentatively placed under this subspecies. They have the hind femora less extensively black at apex than the subsp. *petiolare*, but may differ in minor details from subsp. *chinense*. It seems probable that an area ranging from the Eastern Himalayas to the Chinese province Kwangtung harbours populations which combine to a varying extent certain characters of the subspecies *nalandicum*, *chinense*, and *petiolare*. Unfortunately the material from this area available at present is not extensive enough to serve as a reliable base for the study of the nature and the extent of the apparent intergradation between these subspecies.

Sikkim: 1 ♀ Runjit Valley, 1000 ft., May 1894, coll. C. T. Bingham, 96—30 (BM); very similar to *chinense*, but the basal half of tibiae III orange yellow, rather gradually darkening to brownish black on the apical half (?intergradation of *nalandicum* and *chinense*). 3 ♀ "Sikkim", coll. C. G. Nurse, 1920-72 (BM); hind tibiae black; 2 ♀ Sikkim, leg. F. A. Möller (UZMC); 1 ♀ Sikkim, April 1894, coll. Rothney (OUM); 1 ♀ Darjeeling (KVK); 1 ♀ do. (IRSNB).

Assam: 1 ♀ Khasia Hills, 96—135 (BM); hind femora as in *chinense*, hind tibiae black. Tenasserim: 1 ♀ Moulmein, 15 Aug. 1893 (BM); 1 ♀ do., "*intrudens*", coll. Rothney (OUM); 1 ♀ Upper Tenasserim, Dawnat Range, Febr. 1891, 1 ♀ Middle Tenasserim, Haundraw Valley, Aug. 1894, 1 ♀ Lower Tenasserim, Tavoy, Oct. 1893, all leg. C. T. Bingham (BM); these specimens are very similar to subsp. *petiolare*, but the dark part at apex of femora III is slightly less extensive and less sharply defined (? intergradation between *chinense* and *petiolare*).

Indo-China: 1 ♀ Thuduc, 14 July 1923, R. Vitalis de Salvaza (ML); several specimens from Annam (MP); 1 ♀ Laos, Xiong Koh, 4 April 1920, R. Vitalis de Salvaza, 2 ♀ Tayninh, Nov. 1923 (IRSNB). — These specimens appear to be transitional to subsp. *petiolare*.

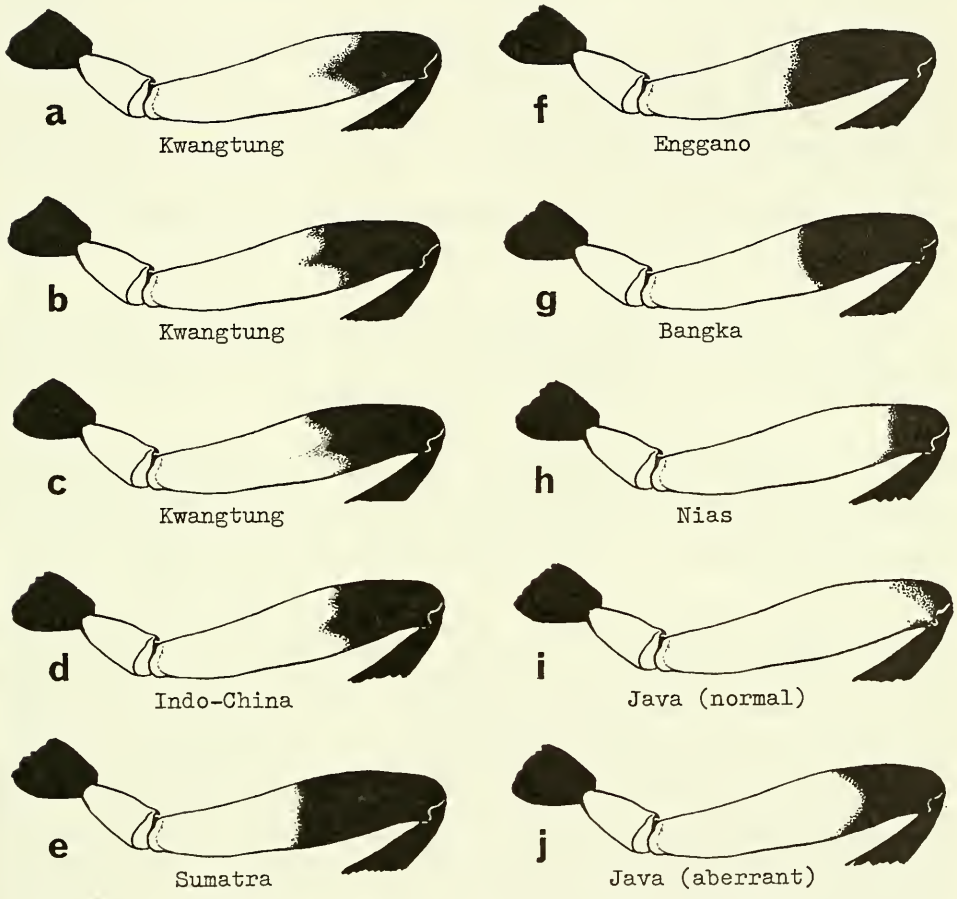


Fig. 27. Inner side of proximal part of hind leg (♀) of some specimens of *Sc. javanum* (Lep.). a and b: *chinense* subsp. n., Lo fao shan, Kwantung, China (ML and ZMB); c: do., Lung tae shan, Kwantung, China (ZMB); d: do., Indo-China, Thuduc, July 1923 (ML); e: subsp. *petiolare* Kohl, N. Sumatra, Deli, Tandjong Morawa (ML); f: do., Enggano I., leg. Wienecke (ML); g: do., Bangka I. (ML); h: ? subsp. *javanum* Lep., Nias, leg. Kleiweg de Zwaan (ML); i: subsp. *javanum* Lep., Java, Bogor, leg. Boerlage (ML); j: do., abnormally dark specimen, Java, Bodjong Kalong, 1935, Mrs. M. E. Walsh (ML)

Sceliphron javanum petiolare Kohl, status nov.

Sceliphron (*Pelopoeus*) *petiolare* Kohl, 1918, Annln naturh. Mus. Wien 32: 95, ♀ — "Deli, Sumatra" (1 ♀ ZMB!, no. 598, leg. L. Martin).

As we expected, examination of the type of *Sc. petiolare* Kohl has shown that this supposed species is based on a teneral specimen such as may be obtained by opening the cells of the clay nests. The colour is said to be "kastanienbraun" or "pechbraun" and this is characteristic for such incompletely developed specimens. The only structural character given by Kohl is that the length of the petiole exceeds that of the hind tibia, whereas it is equal to the length of the hind tibia in *javanum* Lep. In this respect, however, there appears to be some variation within the population(s) inhabiting Sumatra. In most of our specimens from the Northern part of this island the petiole is distinctly longer than the hind tibia (approximately 16 : 15), but in specimens from Palembang, Lampong Districts and Bangka the petiole is not, or only very little, longer than the hind tibia.

As a rule the gastral petiole is more extensively blackened at apex than in the Javan subspecies.

Thailand: series from Bangkok (MP); 1 ♀ "Siam, Mouhot" (labelled: "*javanus* St. Farg., *intrudens* Sm."!); series Peninsular Siam, Nakron Sri Tamarat (BM); 1 ♀ 2 ♂ N.W. Thailand, Ching Mai, Fang, 500 m, 12—19 April 1958, T. C. Maa (BISH); 1 ♂ S. Thailand, Banna, 108 m, 5—10 May 1958, T. C. Maa (BISH); 1 ♀ N.W. Thailand, Sattahib, 24 Nov. 1957, J. L. Gressitt (BISH).

Malaya: 1 ♀ "Mal. 29", in coll. Saunders, "*javanus* St. Farg." on blue label (det. F. Smith) (OUM); series "Malacca" (MP); many specimens from various localities, from northern border to Singapore (BM); 1 ♀ Perak, Kuala Kangsar, 1902, leg. Grubauer (CU); series "Perak, leg. Grubauer" (NMW); Pahang, 1 ♀ Tasek Bera, 28—31 March 1963, M. A. Lieftinck (ML); 1 ♀ Singapore, H. N. Ridley, 1904-101 (BM; apex of petiole black); 8 ♀ do., 1903—1922, various collectors (BM).

Sumatra: 2 ♀ "Sumatra", leg. Ludeking (ML); 1 ♀ "Sumatra", leg. S. Müller (ML); 2 ♀ "Sumatra" (NMW). — Northern Sumatra, 2 ♀ Atchin ("Atjeh") (ML); 1 ♀ Langkat, Namoe Dengas, 15 Febr., Jourin (MCZ); 1 ♀ Deli, E. Büttikofer (ML); 1 ♀ Deli, coll. Wüstnei (UZMC); 1 ♀ Labuan Bilik, leg. Dorsinfang (IRSNB); 2 ♀ Laut Tador, April 1951, R. Straatman (ML); 17 ♀ Tandjong Morawa, Serdang, Dr. B. Hagen (ML); 1 ♀ Tandjong Merah, 18 Dec. 1918, J. B. Corporaal (MR); 1 ♀ Kuala Simpang, March 1954, A. Sollaart (ML). — Central and South Sumatra, 1 ♀ Bua, 1 ♀ Solok, 1 ♀ Rengkeang Lulus, 1 ♀ Muara Labuh, 1 ♀ Surulangun, 4 ♀ Rawas, all leg. Sumatra-Exp. 1877—'78 (ML); 1 ♀ Palembang (ML); 2 ♀ Pagar Alam, 750 m, May 1935, Mrs. M. E. Walsh (BM; ML); 1 ♀ Benkulen, May 1935, Mrs. M. E. Walsh (ML); 10 ♀ do., Bukit Itam, June 1935 (BM). — Lampong Districts, 1 ♀ Tandjongkarang, 1922 (ML); 1 ♀ Damarkatja near Kasui, Sept. 1932, H. R. A. Muller (ML), 1 ♀ Kedaton Estate, 26 March 1937, J. van der Vecht (ML); 1 ♀ Oosthaven, 29 March 1937, Mrs. E. van der Vecht (ML); 1 ♂ Bergen Estate, Jan. 1953, A. Sollaart (ML). — Not located: 6 ♀ "Edi, Klein", 1 ♀ "Tjaili (?), Klein" (UZMC).

Bangka I.: 2 ♀ Bangka, Budding (ML); 3 ♀ Bangka, v. d. Bossche (ML); 2 ♀ Pangkalpinang, Febr.-March 1930, 1 ♂ Aer Mesu, Febr. 1932, 1 ♀ March 1955, J. van der Vecht (ML).

Enggano I.: 1 ♀ Enggano, Wienecke (ML). — Colour of hind femora as in Sumatran specimens.

The representation of this species on the island chain west of Sumatra deserves further study. It is noteworthy that the only available specimen from this area, a ♀ from Nias, is very similar to the Javanese subspecies (see below under *S. javanum javanum*).

Sceliphron javanum benignum (Smith)

Pelopoeus javanus Lepeletier; Smith, 1858, J. Proc. Linn. Soc. Zool. 2: 101 (Sarawak, Borneo; OUM).

Pelopoeus benignus Smith, 1859, J. Proc. Linn. Soc. Zool. 3: 15, ♀ — Sarawak, Borneo (OUM).

Sceliphron sintangense Strand, 1915, Archiv f. Naturgesch. 81A (5): 94, ♀♂ — "Sintang, Borneo" (DEI).

Sceliphron javanum var. *benignum*; Kohl, 1918, Annln naturh. Mus. Wien 32: 92, 93.

This form has been recorded by Kohl from British North Borneo (Darvel Bay and Kinabalu); the type locality of *sintangense* Strand is erroneously said to be in South East Borneo.

Borneo: 1 ♀ "Sar." (= Sarawak, leg. Wallace), coll. Saunders (type of *P. benignus*; OUM); 1 ♀ "Sar" ex coll. F. Smith, 79—22 (BM); 1 ♀ Sarawak, Mt. Matang, 120 m, 14 Nov. 1958, T. C. Maa (BISH); 1 ♀ Sarawak (MCZ); 1 ♀ Borneo, C. Hose, Comm. Inst. 1935—239 (BM); 3 ♀ Borneo, June 1882, Teweh (NMW); 2 ♀ Borneo, Baczes, 1886 (NMW and CU); 1 ♀ Borneo, 1888, ex coll. Tosquinet (IRSNB); 1 ♀ Borneo, S. Müller (ML); 1 ♀ Kinabalu (NMW); 5 ♀ N. Borneo, Samawang, Kudat, Bettotan, July-Aug. 1927, C. Boden Kloss & H. M. Pendlebury (BM); 2 ♀ Smitau, J. van Veldhuijzen, Borneo-Exp. (ML), 1 ♀ do., Febr. 1894, J. Büttikofer (ML); 1 ♀ West Borneo, Marbau Tjondong, April 1923 (MZB); East Borneo, 1 ♀ Balikpapan (ML), 1 ♀ Balikpapan, Wain River, Nov. 1950, A. M. R. Wegner (ML); 1 ♀ Tabang, Bengen River, 12 Sept. 1956 (ML), 1 ♀ Samarinda, 14 Dec. 1956, A. M. R. Wegner (ML); S. Borneo, 1 ♀ from Staudinger (ML), 1 ♂ Kotawaringin, March 1953, leg. Inen (ML).

Bawean I.: 7 ♀ "Bawean, Regenzeit, H. Fruhstorfer" (ML).

Sceliphron javanum aemulum Kohl

Sceliphron (*Pelopoeus*) *aemulum* Kohl, 1918, Annln naturh. Mus. Wien 32: 94, ♀ — "Mindanao, Philippinen" (NMW).

Sceliphron "intrudens (Smith)"; Williams, 1919, Bull. Hawaii. Sugar Pl. Ass., Ent. Ser. 14: 120, Fig. 57, 58 (bionomics in Luzon) [incorrect identification].

Sceliphron luzonensis Rohwer, 1921, Phil. J. Science 19: 674, ♀ — Mt. Maquiling, Laguna, Luzon (type ♀, no. 23637, USNM).

Sc. aemulum Kohl is another species based by Kohl on a wasp with brownish body colour which is a teneral specimen of a black-bodied species (see under *Sc. javanum petiolare* Kohl). Rohwer compared his *Sc. luzonensis* with *Sc. intrudens* (Sm.) from Celebes, but apparently he did not know Kohl's monograph and he overlooked the important character of the shape of the hind coxae, by which *Sc. javanum* is at once distinguished from *Sc. intrudens.*

According to Kohl the first antennal segment is yellow and the two following segments rusty yellow; Rohwer describes the antennae as black, with only the scape and pedicellum "rufo-piceous". In the specimens we have seen the first and second segments are distinctly rusty or reddish yellow; the third segment is rusty yellow beneath, at least at the base, but rather dark above.

Luzon: 1 ♀ Los Baños, 1913, leg. Ledyard (ML), 1 ♂ do., July 1918, leg. C. S. Banks (ML), 1 ♂ do., July 1921, F. X. Williams (ML), 1 ♀ do., 26 Aug. 1926, P. M. Ungos (MCZ), 4 ♀ do., 100—1500 ft., 31 May—5 June 1947, CNHM Phil. Zool. Exp., F. G. Werner leg. (CNHM), 3 ♀ do., March 1953, Sept. 1953 and July 1954, Townes family (coll. Townes; ML); 1 ♀ Mt. Maquiling, 60—100 m, 22 Aug. 1925, leg. N. O. Flores (MCZ); 1 ♀ do., 400 ft., 1 June 1932, F. C. Hadden (BISH); 1 ♀ do., 27 Jan. 1931, F. S. Revira (UMMZ); 1 ♀ Maquiling, 18 Febr. 1954, E. Dagang (BPI); 1 ♀ Atimonan, July 1963, A. Concepcion (BPI).

Mindoro: 2 ♀ Alcate, Vict., 6—9 April 1954, Townes family (coll. Townes; ML).

Negros: 3 ♀ Negros Or., Mt. Canlaon, 3600 ft., 28 April—7 May 1953, Townes family (coll. Townes; ML).

Cebu: 1 ♀ Cebu City, Camp 7, 25 May 1952, C. R. Baltazar (BPI).

Leyte: 1 ♀ Palo, 27 June 1951 (BISH); 1 ♀ 10 miles East of Tacloban, 19 Aug. 1945, D. G. Hall (coll. KVK).

Palawan: 1 ♀ Brooke's Point, sea level, 1 ♀ Tigoplan River Valley, Brooke's Point, 180 ft., 24 and 29 April 1947, resp., CNHM Phil. Zool. Exp., F. G. Werner leg. (CNHM).

Mindanao: 1 ♀ Mindanao (NMW; type of *Sc. aemulum* Kohl); 1 ♀ Davao Prov., Calian, July, 3 ♀ Mt. Apo, 2000 ft., Oct., leg. C. F. Clagg (MCZ); 1 ♂ Agusan, Los Arcos, 19—23 Nov. 1959, C. M. Yoshimoto (BISH).

The collection of the IRSNB contains 1 ♀ with label: "Ins. Philipp., coll. Ballion, ex coll. Puls".

Sceliphron javanum javanum (Lepeletier)

Pelopoeus javanus Lepeletier, 1845, Hist. Nat. Ins. Hym. 3: 309, ♀ — "Java" (type ex coll. Serville in coll. Spinola, Mus. Torino).

Sceliphron (*Pelopoeus*) *javanum* [err.: "Smith"!]; Kohl, 1918, Annln naturh. Mus. Wien 32: 92.

Sceliphron spec., Menzel, 1928, Rev. Suisse Zool. 35: 265—270, figs. (notes on bionomics in Java; dimensions of nest: 13 × 10 × 4 cm! indicate that the notes refer to *Sc. javanum*).

We have some doubt concerning the identity of the type of *Pelopoeus javanus* Lep., described from material in the collection of Mr. Audinet-Serville (now in Zool. Mus. Univ. Turin). Lepeletier (1845) describes the colour of the hind legs as follows: "les deux (pattes) postérieures noires, avec les trochanters et la base des cuisses, jusque passé le milieu, de couleur jaune". The Sumatran form seems to fit this description better than the Javan race. Occasionally, however, specimens are found in Java which resemble the Sumatran subspecies very closely (see Fig. 27). It would therefore be difficult to prove that the type is incorrectly labelled, even if its coloration is not typical for the Javan race.

In Java this wasp is fairly common in cultivated areas, up to about 1000 m above sea level; it is, however, generally less numerous than *Sc. madraspatanum*.

Java: 1 ♀ Java, Kuhl & van Hasselt (ML); 1 ♀ Java, Reinwardt (ML); 1 ♂ Java, Mulié (ML); 2 ♀ Java, coll. Drewsen (UZMC), 1 ♀ "Java, coll. Schramm" (MCZ); 1 ♀ Java, "49/5" (BM); 1 ♀ Java, leg. Horsfield, "E.I.C., 60—15" (BM); 1 ♀ without locality label, "*Sc. intrudens* Sm." ex coll. Bingham (BM); 1 ♀ Buitenzorg (= Bogor), 1881, "Smith coll. pres. by Mrs. Farren White, 99-103" (BM). — West Java, 1 ♀ West Java, Febr. 1937, Mrs. M. E. Walsh (BM); Udjong Kulon, 3 ♀ Teluk Peutjang and Tjigeunteur, July 1955, A. M. R. Wegner (ML); 1 ♀ 2 ♂ Batavia (= Djakarta), 1907, 1908, E. Jacobson (ML); 2 ♀ Batavia, leg. Westermann (1 ♀ Dec. 1816) (UZMC); 1 ♀ Buitenzorg (= Bogor), Dr. J. G. Boerlage (ML), 5 ♀ 4 ♂ Buitenzorg, 1928—1935, J. van der Vecht (ML), 6 ♀ Djampang Tengah, 1933-5, Mrs. M. E. Walsh (ML), 2 ♀ Bodjongkalong, Sept. 1935, Mrs. M. E. Walsh (ML); 2 ♀ Sukabumi (MR), 2 ♀ do. (IRSNB) — Central Java, 3 ♀ Ambarawa, leg. Ludeking (ML), 2 ♀ Mt. Slamet, Baturraden, May 1934, F. C. Drescher (ML), 1 ♀ Baron, Gunung Sewu, March 1911, E. Jacobson (ML). — East Java, 1 ♀ Rembang, 1 ♀ Kediri, leg. Piepers (ML); 1 ♀ Ngantang (Rembang) (MM); 1 ♀ Idjen Mts., July 1940, H. Lucht (ML).

Nias: 1 ♀ Mt. Sitoli, leg. Kleiweg de Zwaan (ML). — This specimen is provisionally placed here because in the coloration of the hind femora (fig. 27) it is closer to *javanum* than to *petiolare*: however, the yellow and the black areas are more sharply separated than in *javanum*.

Sceliphron javanum tenggarae van der Vecht

Sceliphron (*Pelopoeus*) *javanum* "var. *nalandicum* Strand"; Kohl, 1918: 94 (Flores; Lombok).

Sceliphron javanum tenggarae van der Vecht, 1957, Verh. naturf. Ges. Basel 68: 369, ♀ ♂ — Sumbawa; Komodo; Flores; Sumba (type ♀, Flores, ML).

The subspecies of *javanum* occurring in the Lesser Sunda Islands (Indonesian name: Nusa Tenggara) is very similar to subsp. *nalandicum* Strand from Ceylon and to subsp. *laboriosum* from Aru and New Guinea.

In addition to the material recorded in 1957 we have examined the following specimens.

Lombok: 6 ♀ 2 ♂ Sapit, 2000 ft., April 1896, H. Fruhstorfer (NMW; 1 ♂ UZMC); 1 ♀ 1 ♂ Swela, 22—28 March 1927, Dr. B. Rensch (ZMB); 2 ♀ "Lombok", Carl Aurivillius (NRS).
Sumbawa: 2 ♀ 1 ♂ Bima, "ex coll. Bingham, 1902-120" (BM); 1 ♀ Sumbawa besar, West Sumbawa, 24 April—2 May 1927, Dr. B. Rensch (ZMB); 1 ♀ East Sumbawa, 2—4 June 1927, 1 ♀ Dompoe, East Sumbawa, 24—25 May 1927, Dr. B. Rensch (ZMB).
Flores: 3 ♀ Mborong, 30—31 March 1958, A. M. R. Wegner (MZM; ML); 2 ♂ Rana Mese, 1300—1500 m, April 1958, A. M. R. Wegner (MZB); 1 ♀ 1 ♂ Flores, 1876, coll. Tosquinet (IRSNB).
Solor: 1 ♀ leg. Hoedt (ML).
Alor: 1 ♀ Kalabahi, 30 March 1957, A. M. R. Wegner (ML).

The collection of the Leiden Museum also contains 2 ♀ 3 ♂ labelled "Wetar, leg. Schädler", but these specimens differ from those recorded above in having the apical half of the hind femora and tibiae more or less strongly infuscated. They are thus transitional to the subspecies *timorense* of Timor. Since the latter island is less distant from Wetar than the distribution area of typical *tenggarae*, it seems very well possible that the two forms intergrade in Wetar. In this connection it may be noted that the Leiden Museum possesses a female of subsp. *timorense* which bears a label with the same data as the series of atypical *tenggarae* recorded above (Wetar, 1898, leg. Schädler). For the moment, however, we hesitate to attach much value to this fact, for Schädler's material was evidently labelled after its receipt by the Leiden Museum, and it seems possible that the latter label is incorrect. Evidently further collecting in Wetar is necessary to determine the status of the population inhabiting this island.

Sceliphron javanum timorense van der Vecht

Pelopoeus spirifex Linn.; Smith, 1871, J. Proc. Linn. Soc. Zool. 11: 360 ("Timor") [misidentification].
Sceliphron javanum timorense van der Vecht, 1957, Verh. naturf. Ges. Basel 68: 369, ♀ ♂ — Timor; Roti; Wetar (type ♀, Timor, ML).

In addition to the specimens studied in 1957, the senior author has seen 1 ♀ from Pulo Semau (close to Timor, near Kupang) and 1 ♀ "Timor, Cupan" (= Kupang), both collected in April 1889 by L. Loria (MCG).

Sceliphron javanum laboriosum (Smith)

Pelopoeus laboriosus Smith, 1859, J. Proc. Linn. Soc. Zool. 3: 159, ♀ — "Aru", leg. Wallace (OUM).
Sceliphron lorentzi Cameron, 1911, Nova Guinea 9, Zool.: 201, ♀ — "Bivak Island", Lorentz River, South New Guinea (MA).

The type of *Sc. lorentzi* is in the collection of the Zoological Museum at Amsterdam, where the senior author examined it in 1934. Cameron's description is incorrect in several details. The sculpture of the thorax is not different from that of *Sc. javanum javanum*;

not the metapleura are "striated", but the sides of the propodeum; the apex of the first and second abdominal segments is not "longitudinally striate", but these parts had been wet and the appearance of the tomentum has been mistaken for surface sculpture.

Both *P. laboriosus* and *Sc. lorentzi* were placed by Kohl (1918) under the unidentified species at the end of his monograph.

Aru: 1 ♀ with blue label "Aru", Saunders coll. (OUM; type of *P. laboriosus* Smith); 1 ♀ "Aru", "F. Smith coll. 79-22" (BM; this specimen has two Strepsiptera under tergite 4); 1 ♀ "Aru, Wallace", Drewsen coll. (UZMC).

New Guinea: West New Guinea, 1 ♀ Vogelkop, Bomberi, 700—900 m, 10 June 1959 (BISH); 1 ♀ Mamberamo River, Prauwenbivak, 1920, W. C. van Heurn (Van Overeem Exp., MZB); 1 ♀ Hollandia, June 1937, W. Stüber (ML); 2 ♀ Genjam, 40 km West of Hollandia, 100—200 m, 1—10 March 1960, T. C. Maa (BISH); 2 ♀ Hollandia, Febr. 1957, J. van den Assem (ML); 2 ♀ Ifar near Hollandia, Aug. 1957, G. den Hoed (ML), 1 ♀ do., 300—600 m, 22 June 1959, T. C. Maa (BISH); 10 ♀ Sibil, Star Range, 1260 m, 15 April—31 Aug. 1959, Netherlands New Guinea Exp. (ML; 1 ♀ USNM). — Southwest New Guinea, 1 ♀ Bivak Island (MA, type of *Sc. lorentzi* Cameron). — North East New Guinea, 1 ♀ Finisterre Range, Saidor-Sibog, 27 May—5 June 1958, W. W. Brandt (BISH); 1 ♀ Kassam, 1350 m, 48 km East of Kainantu, 28 Oct. 1959, T. C. Maa (BISH). — Papua, 1 ♀ Kokoda, 1200 ft., Sept.-Oct. 1933, L. E. Cheesman (BM); 2 ♀ Yule Island (MP).

Sceliphron (Sceliphron) laetum (Smith)

The colour pattern of this beautiful species is fairly constant. More or less distinct deviations from the "normal" coloration appear to occur in two parts of the area of distribution, viz. in Western Australia and in the Moluccas.

Already Smith (1856) noted that specimens from Swan River have the yellow spots in scutellum and "metathorax" (= propodeum) nearly or quite obsolete. In 1910 Turner described such specimens as "st. *cygnorum*", giving the following colour characters: "the yellow markings are absent from the scutellum, postscutellum, apex of the median segment, and fourth abdominal segment; the base of the intermediate femora is marked with black and the yellow on the pronotum and fifth abdominal segment is more or less reduced".

Although we have seen several specimens from Western Australia, none was found to agree exactly with this description, for the scutellum and postscutellum were always marked with yellow. Probably the most reliable character of the melanistic form of this area is the absence of a yellow band on the fourth gastral tergite. We have observed this character in specimens from Yelbeni and Midland, but from the first mentioned locality we have also seen a specimen with a distinct yellow band on tergite 4 and one with a reduced band. At this moment we must conclude that our data do not permit to say with certainty whether the darker form may be regarded as a subspecies. According to Turner (l.c.) the form *cygnorum* is furthermore characterized by certain peculiarities of the sculpture of the propodeum and the shape of the submarginal cells; we have been unable, however, to find constant differences in these respects between specimens from Western Australia and from other areas.

On the other hand the available material from the Northern Moluccas indicates that the population(s) occurring in these islands are sufficiently different from typical *laetum* to deserve subspecific status.

Sceliphron laetum laetum (Smith)

Pelopoeus laetus Smith, 1856, Cat. Hym. Br. Mus. 4: 229, ♀, Pl. 7 Fig. 1 — "Australia (Port Essington; Macintyre River; Swan River); Ceram" (BM; lectotype by present designation = 1 ♀ no. 21-610, Macintyre River, "51/36").

Sceliphron laetum "st. *cygnorum* st. n." Turner, 1910, Proc. Zool. Soc. Lond. 1910: 343, ♀ — "South Western Australia" (BM, type no. 21.611, "N. Holland, 44/4").

Sceliphron laetum; Kohl, 1918, Annln naturh. Mus. Wien 32: 95. — Krombein, 1949, Proc. Hawaii. ent. Soc. 13: 370, 386 (Guam, Mariana Is.: Arakabesan and Koror Is., Palau Is.). — Id., 1950, ibid. 14: 138 (Yap, Caroline Is.).

Celebes: North Celebes, Menado, 1 ♀ June 1949, 2 ♀ Aug. 1949, C. J. H. Franssen (ML). This is the first record of this species from Celebes. The occurrence of *Sc. laetum* in Menado and direct environs (Experiment Garden Mapanget) is very probably due to a recent introduction.

Buru: several specimens of both sexes, collected by Denin, 1913, 1914 (one female stylopized!) (MZB; ML; NMW); 2 ♀ 1 ♂ Namlea, 1925 (ML); 5 ♀ Station 1, Febr.-Dec. 1921, L. J. Toxopeus (MA; ML); 1 ♀ Waspait, 1 ♀ Balubalu, June 1959, A. M. R. Wegner (ML).

Amboina: 1 ♀ Amboina (MBUD).

Salawati: 2 ♀ Salawati, leg. Bernstein (ML).

Kai Is.: 1 ♀ Tual, 1923, Th. Mortensen (UZMC).

Aru Is.: 3 ♀ 3 ♂ Aru Is., leg. Rosenberg (ML), 1 ♀ Aru (MBUD).

Schouten Is.: 1 ♀ Biak, 10 Febr. 1952, L. D. Brongersma (ML), 1 ♀ Base Biak (W. of Sorido), March 1955, L. D. Brongersma c.s. (ML), 1 ♀ do., L. van der Hammen (ML).

New Guinea: 3 ♂ "New Guinea, ter Poorten" (MZB). — Vogelkop, 1 ♀ Sorong, June 1938, L. J. Toxopeus (MZB); 1 ♀ Doom I. near Sorong, 22 March 1952, L. D. Brongersma (ML); 1 ♀ Klamono, Dec. 1947, Schumacher (NMB). — North West New Guinea, 1 ♀ Motorbivouac, Aug. 1926, Docters van Leeuwen (Sterling Expedition; ML); 1 ♀ Koiwi River, 6—22 Febr. 1911, K. Gjellerup (ML); 1 ♀ Hollandia, harbour, 5 Aug. 1952, L. D. Brongersma (ML); 1 ♀ do., governor's palace, Aug. 1952, L. D. Brongersma (ML); 1 ♂ do., 13 Oct. 1954, L. D. Brongersma & L. B. Holthuis (ML); 1 ♀ do., 13 March 1960, T. C. Maa (BISH); 1 ♂ Bewani Hills near Hollandia, March 1937, W. Stüber (ML); 5 ♀ 1 ♂ Ifar, 300 m, Sept.-Nov. 1956, J. van den Assem (ML), 1 ♀ 4 ♂ do., 8—13 Sept. 1959, C. van Heijningen (ML); 2 ♂ Genjem, 25 Oct. 1956, J. van den Assem (ML); 1 ♀ Sentani Lake, Joka, 80 m, 21 Oct. 1954, L. D. Brongersma & L. B. Holthuis (ML). — South West New Guinea, 2 ♀ Merauke, H. P. Winkelman (ML), 1 ♀ do., Dec. 1957, Mrs. D. Bergman (ML); 1 ♀ 2 ♂ Mindiptana, Aug. 1959, from nest, leg. fr. Monulphus (ML). — North East New Guinea, 1 ♀ 2 ♂ Friedrich Wilhelmshafen, 1896, 12 ♀ 20 ♂ Astrolabe Bay, Stephansort and Erima, 1896—7, all leg. L. Biró (MBUD; 1 ♀ 1 ♂ ML); 1 ♀ Bubia, 4 Nov. 1959, T. C. Maa (BISH); 1 ♀ Lae, sea level, 4 June 1961, 1 ♀ Wau, Morobe Distr., 1200 m, 2 June 1962, J. Sedlacek (BISH); 1 ♀ Torricelli Mts., Siaute, 9—11 Nov. 1958, W. W. Brandt (BISH); 2 ♂ Finschhafen, sea level, Morobe Distr., 15—25 Sept. 1964, H. M. van Deusen, 7th Archbold Exp. (AMNH). — Papua, 5 ♀ 1 ♂ Rigo, July 1889, 1 ♀ Waicunina, June 1890, 1 ♀ Hula, Jan. 1891, 1 ♀ Kamali, Febr. 1891, 3 ♀ Kapakapa, May-June 1891, all leg. L. Loria (MCG; 2 ♀ ML); 1 ♂ Port Moresby, Febr. 1918, 1 ♀ do., Febr. 1920, J. T. Zimmer (CNHM). — Papua, 1 ♀ Rambuso, Sudest Is., 24 Sept. 1956, 5th Archbold Exp., L. J. Brass (AMNH); 1 ♂ Goroka, 1530 m, 30 April—3 May 1959, 1 ♀ Brown River, Central Distr., 22 April 1959, 1 ♂ Roku, Central Distr., 23 April 1959, all C. D. Michener (BISH).

Bismarck Is.: 1 ♀ "Neu Pommern" (MBUD); 1 ♀ Manus Is., Lorengau, sea level, 15—29 Dec. 1959, T. C. Maa (BISH); 2 ♀ 2 ♂ Puktas, Baining Mts., 22 Nov. 1957, J. Smart (BM).

Solomon Is.: Bougainville, 1 ♂ 2 June 1956, J. L. Gressitt (BISH); 4 ♂ Aropa near Kieta, 1960, R. W. Paine (ML). — New Georgia, Munda, 1 ♀ 21 July 1959, T. C. Maa (BISH). — Guadalcanal, 2 ♀ Lunga and Tenaru, Aug. 1928, R. W. Paine (BM); several specimens 1933—'34, H. T. Pagden (coll. Pagden; ML); 1 ♀ 2 Sept. 1945, H. M. Malkin (CAS); 4 ♀ 2 ♂ Lunga River Bridge, July-Aug. 1960, J. Schenk (PV). — Tulagi, several specimens 1933—'34, H. T. Pagden (coll. Pagden; ML). — Malayta, 1 ♀ 1 ♂ Jan. 1932, R. A. Lever (BM). — Russell Is., 1 ♀ Lingatu, June 1932, R. A. Lever (BM).

Guam: 1 ♀ Pt. Oca, 3 Aug. 1945, G. E. Bohart and J. L. Gressitt (CAS; evidently a recent introduction; see Krombein, 1949).

New Caledonia: 1 ♀ 7 ♂ Noumea, Anse Vata, Jan.-Febr. 1957, J. Rageau, no. 1957-149 (BM).

Australia: 8 ♀ 2 ♂ "Nov. Holl.", coll. Drewsen (UZMC); 2 ♀ "Austr. boreal.", coll. Drewsen (UZMC); 3 ♀ "Terra van Diemenii", leg. Parzudaki (UZMC). — Queensland, 1 ♂ Halifax, May 1919, F. X. Williams (ML); 1 ♀ 1 ♂ Brisbane, Moorooka, Jan. and Nov. 1944, E. F. Riek (ML); 1 ♀ Brisbane, Nov. 1955, F. G. T. Smith (ML). — N.S. Wales, 2 ♀ Marrickville near Sydney, 15 and 29 Dec. 1955, R. H. Mulder (coll. P. M. F. Verhoeff); 1 ♀ Cooma, Dec. 1956, J. Sedlacek (LAM); 1 ♀ Casula, 11 Febr. 1958, 1 ♀ Barham, 23 March 1960, M. I. Nikitin (BM). — South Australia, 2 ♀ Adelaide, coll. Drewsen (UZMC); 3 ♀ Adelaide (ML). — Western Australia, 1 ♀ Marloo Station, Durarga, April 1935, A. Goerling (ZMB); several specimens from Perth and other localities in Western Australia (WAM); 3 ♀ 3 ♂ Derby, April 1961 and March 1962, P. Slater (coll. Slater; ML); 2 ♂ Cardup Brook, Febr. 1963, G. F. Mees (ML).

In the British Museum this species is represented by specimens from New Guinea (Hollandia; Merauke), Solomon Is. (Malayta and Russel Island), and Australia (Queensland: Townsville, Mackay, and Toowoomba; Northern Territories: Darwin; Central Australia: Hermannsburg; Western Australia ("var." *cygnorum*: Yallingup; South Perth; Swan River; Yanchep). The Paris Museum possesses specimens from New Guinea (Yule Island) and Australia (Victoria).

Sceliphron laetum maindroni van der Vecht subsp. nov.

Pelopoeus laetus Smith; Maidron, 1878, Ann. Soc. ent. France (5) 8: 389, 394, Pl. 9, Fig. 1—7 (Ternate, Tidore; nesting habits).

♀ ♂ — Characterized by a reduction of the yellow markings. Band on pronotum as a rule interrupted medially. Markings on mesopleura and scutella slightly reduced in size. Propodeum either entirely black or only with traces of yellow spot at apex (in some males with two small yellow spots). Gastral petiole dark red above, fuscous to black at sides and below. First gastral tergite not entirely yellow: more than the basal half reddish to fuscous, apex with narrow black band which is widened medially. Legs hardly darker than in the typical form, but inner side of hind femora almost entirely black (in *laetum laetum* about the basal one fourth to one third red).

Ternate: 1 ♂ "Ter" (= Ternate, leg. Wallace) (OUM); 2 ♀ 1 ♂ Ternate, leg. Forsten (ML); 2 ♀ Bukunora, 50—100 m, 1 ♀ 3 ♂ Bukumenjiku, 75 m, 1 ♂ Ake Abdas, 1500 m, all Sept. 1951 (MZB; ML).

Halmahera: 1 ♀ Kau, sea level, Oct. 1951 (MZB), 2 ♀ Tolewang, Oct. 1951 (ML).

Obi: 7 ♀ Lake River, Kasowari, Anggai, and Laiwui, July-Nov. 1953, A. M. R. Wegner (MZB; ML).

Batjan: 1 ♀ "Bac" (= Batjan, leg. Wallace) (OUM).

The type is a female from Bukunora (ML), the other specimens recorded above are paratypes.

Tanimbar: A female collected in April 1938 by P. Buwalda on Pulu Jamdena is very similar to the specimens from the North Moluccas. The propodeum is black with small and faint reddish spots at apex, but the hind femora are more extensively red at base, the gastral petiole is entirely red, and the band on the pronotum is not interrupted. Two females from Tanimbar (MR) and five from Tanimbar Larat (NMW; 1 ♀ ML) have the same colour pattern.

Sceliphron (Sceliphron) fistularium (Dahlbom) (Fig. 1)

Pelopoeus fistularius Dahlbom, 1843, Hymen. Eur. 1: 23, ♀ ♂ — "Ad africae promont. bon. Sp.", leg. Thunberg: "Brasilia", leg. Erichson; 1845, do: 434 ("America").

Pelopoeus histrio Lepeletier, 1845, Hist. Nat. Ins. Hym. 3: 316, ♀ ♂ — Cayenne, coll. Serville (? loc.).

Sceliphron (*Pelopoeus*) *fistularium*; Kohl, 1918, Annln naturh. Mus. Wien 32: 97.

Sceliphron fistulare; Porter, 1926, Proc. U. S. nation. Mus. 70: 14; Richards, 1937, Trans. R. ent. Soc. Lond. 86: 105.

The species described from Cayenne by Lepeletier (1845) under the name *Pelopoeus bimaculatus* was placed by Kohl in the synonymy of *Sc. fistularium*. We agree with Porter (1926), however, that Lepeletier's description must have been based on a specimen of *Sc. figulum* (= *Sc. asiaticum* in the present paper).

Although *Pelopoeus histrio* was described by Lepeletier from the Serville collection, the type appears not to be in the Museum at Torino, where many types from this collection are preserved (see Bradley, 1957).

Mexico: 3 ♀ Omealca, Orizaba, M. Trujillo (BM; 1 ♀ ex coll. Cameron 1914-110).

Guatemala: 1 ♀ S. Geronimo, 1 ♀ Panzós, leg. Champion (BM).

Nicaragua: 1 ♂ Chontales, leg. Janson (BM).

Panama: 2 ♀ 1 ♂ Taboga, 1915—'16, Dr. Th. Mortensen (UZMC). — 1 ♀ San Lorenzo, Champion, ex coll. Cameron (BM).

Colombia: 3 ♀ Colombia, coll. Drewsen (UZMC); 1 ♀ Colombia, coll. Saunders (OUM); 1 ♀ 6 ♂ Cunaga Magd., March 1927, G. Salt (BM); 1 ♀ Andagoya, R. Condoto, Choco, H. G. F. Spurrell (BM; 1916-273); 1 ♀ Bogota (MBUD).

Gorgona Is.: 4 ♀ 7 ♂ July 1924, L. E. Cheesman (BM).

Venezuela: Merida (NMW); 1 ♂ La Trinidad, Maracay, July 1934, C. Vogl (ZMB).

Trinidad: 1 ♀ Guanapo, 20 Aug. 1929, D. C. Geijskes (ML).

British Guiana: 1 ♂ leg. Rodway (BM); "common on the coastal plain" (Richards, 1937); 1 ♀ Bartica, 8 April 1933, J. Ogilvie (BM).

Suriname: Paramaribo, 1 ♀ (MBUD), 1 ♀ Sept. 1957, P. H. van Doesburg Jr. (ML), 1 ♀ Jagtlust, 5 July 1938, D. C. Geijskes (MR); 1 ♀ Charlesburg, 29 April 1963, P. H. van Doesburg Jr. (ML); 2 ♀ 1 ♂ Zorg en Hoop, May 1963, from nest, J. van der Vecht (ML); 1 ♀ do., Sept. 1963, J. W. Broekhuizen (ML); 6 ♀ 1 ♂ Clevia, May and June 1963, P. H. van Doesburg Jr. and J. van der Vecht (ML); 4 ♀ Ma Retraite, swamp forest, in Malaise-trap, Jan.-March 1964, D. C. Geijskes (ML); 1 ♀ Kwatta, March 1964, D. C. Geijskes (ML). 2 ♀ Domburg, in Malaise-trap, Nov.-Dec. 1963, D. C. Geijskes (ML); 20 ♀ Republiek, in Malaise-trap, Sept.-Nov. 1963, D. C. Geijskes (ML); N.E. Suriname, 1 ♀ Moengatapoe-Wiawia, Oct. 1948, D. C. Geijskes (ML); 1 ♀ Zanderij, May 1961, P. H. van Doesburg Jr. (ML); 2 ♀ Mapane Area, Camp 8 LBB, 1 ♂ Auca on Suriname River, May 1963, J. van der Vecht (ML); 1 ♀ between Kabel and Brownsweg, 15 April 1965, G. F. Mees (ML); 2 ♀ Sara Creek, Soekoewatra, Dec. 1963, D. C. Geijskes (ML); 1 ♀ Bakhuis Mts., July 1963, R. van Aerde (ML); 7 ♀ Coeroeni, Upper Corantijn River, June 1963, J. G. Wessels Boer (ML); Wilhelmina Mts., 6 ♀ Kayser Airstrip, June 1963, 1 ♀ Lucie Camp, July 1963, H. Pijpers (ML).

Ecuador: 1 ♀ Cunalos, Jan. 1937, Dr. Schultze Rhonhof (ZMB).

Peru: 3 ♀ 1 ♂ Lima, Galatea Exp. (UZMC); 1 ♀ 1 ♂ Sullana, Hacienda Mallares, 10 Dec. 1957, W. Markl (NMB); 2 ♀ Satipo, 750 m, Jan. 1949, coll. Lindemans (MR); 2 ♀ Yurimaguas (MBUD); 19 ♀ 2 ♂ Dept. Loreto, Pucallpa, 1950—'65, throughout the year, J. M. Schuncke (BM; 1 ♂ ML).

Brazil: 4 ♀ 1 ♂ Brazil, from Mus. Berlin (ML); 1 ♀ Brazil, van Medenbach de Rooy (ML); 1 ♀ Brazil, from Westwood (ML); 2 ♀ Brazil, coll. Westermann (UZMC); 1 ♀ Amazonas,, 2 ♀ Pará, coll. Saunders (OUM); 3 ♀ Pará, Belem and Rio Acara, 1930, E. Horváth (MBUD); 2 ♀ Pará, 1931, G. Molnár (MBUD); 2 ♀ Manaus, Febr. 1896, E. E. Austen (BM); Amazon, 1 ♀ Rio Japura, 1 ♀ Manaus, leg. Roman (NRS), 1 ♀ Manaus, leg. Huebner (NRS); 4 ♀ Matto Grosso (NRS); 1 ♀ Recife, Pernambuco, Dec. 1934, Schubart (ZMB); 1 ♀ Rio de Janeiro, coll. Westermann, 3 ♀ Rio de Janeiro, leg. Friis (UZMC); 1 ♂ Corcorado, Rio de Janeiro, 20 May 1912, G. E. Bryant (BM); 1 ♀ Sta. Catarina (ML); 2 ♀ Sta. Catarina, H. Schulz, coll. Wüstnei (UZMC); 2 ♀ Blumenau, Sta. Catarina, 16 Nov. 1929, E. Wenzel (ZMB); 1 ♀ Blumenau (MBUD); 2 ♀ 2 ♂ Pelotas, 10 Dec. 1947 (NMW; BM); 1 ♀ do., 10 March 1966, C. M. Biezanko (BM).

Argentina: 1 ♀ Tucuman, coll. Saunders (OUM).

The collection of the Museum at Vienna (NMW) contains specimens from Venezuela (Merida), Suriname, Colombia, Ecuador, Bolivia, and Brazil (Rio Grande).

In the British Museum the senior author has seen a ♀ from the Cape Verde Is., S. Vincent, with label "imported" (no. 1916-273).

The U.S. National Museum possesses 1 ♀ 1 ♂ of this species with labels: "St. Vincent, W. I., H. H. Smith" and "*Sceliphron fasciatus* Lep." Apparently they form part of the series recorded under the latter name by Ashmead in 1900 (Trans. ent. Soc. Lond. 1900 : 308).

These specimen, kindly sent to me by Dr. Karl V. Krombein, differ from continental material in having the yellow markings on pronotum and propodeum distinctly reduced; in the male the dorsum of the propodeum is entirely black. Furthermore the hind legs are entirely black, except for a very small spot on each coxa in the male.

Postscript. — Recently, Dr. Arnold Menke (U.S. National Museum, Washington, D.C.) kindly drew my attention to the fact that two of the specific names used in this paper are invalid homonyms.

Sceliphron jamaicense (Fabr.), described in 1775 as *Sphex jamaicensis*, is preoccupied by *Vespa jamaicense* Drury, 1773, which has been recognized as a species of *Sphex* Linné. The name *Pelopoeus annulatus* Cresson, 1865, is available as a replacement name, and the species in question should henceforth be called *Sceliphron annulatum* (Cresson).

Sceliphron hemipterum (Fabr.), described in 1798 as *Sphex hemiptera*, is a junior homonym of *Sphex hemiptera* Scopoli, 1772 (Annus 5 : 122). It seems, however, that this latter species has generally been overlooked and that it cannot be identified with certainty. For this reason I hesitate to replace the well known name *hemipterum* (Fabr.) by the junior synonym *fuscum* Klug; if further investigations would indeed prove the name *Sphex hemiptera* Scopoli to be useless, I would prefer to see this name rejected by the International Commission on Zoological Nomenclature. — J. van der Vecht.

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A STUDY OF NEUQUENAPHIS BLANCHARD, 1939, WITH DESCRIPTIONS OF NEW SPECIES (APHIDIDAE, HOMOPTERA)

by

D. HILLE RIS LAMBERS

Bladluisonderzoek T.N.O., Bennekom

Abstract

In this paper the following new species are described from Chile and Argentine: *Neuquenaphis bulbicauda,* from *Nothofagus dombeyi*; *Neuquenaphis essigi* and *Neuquenaphis flavipes,* from *Nothofagus obliqua*; *Neuquenaphis palliceps,* from *Nothofagus dombeyi*; *Neuquenaphis schlingeri, Neuquenaphis sensoriata* and *Neuquenaphis similis,* from *Nothofagus obliqua.*

Neuquenaphis edwardsi (Laing, 1927), *Neuquenaphis chilensis* Essig, 1953, and *Neuquenaphis michelbacheri* Essig, 1953 are redescribed. Oviparae and a male of *Neuquenaphis,* as well as first instar larvae are described for the first time. The genus *Spicaphis* Essig, 1953, type-species *Spicaphis michelbacheri* Essig, 1953, is considered a synonym of *Neuquenaphis* Blanchard, 1939, type-species *Myzocallis edwardsi* Laing, 1927; after which *Neuquenaphis michelbacheri* (Essig, 1953, p. 69), because of *Neuquenaphis michelbacheri* Essig, 1953, p. 66, requires a new name (p. 274).

The systematic position of the genus *Neuquenaphis* is discussed.

Introduction

Dr. Evert I. Schlinger, Riverside, California, made a collecting trip through Chile and Argentine to Tierra del Fuego. At my request he gave special attention to the aphids living on *Nothofagus* spp. The many samples he collected were preliminarily sorted by Dr. Robert C. Dickson, Riverside, California, and the majority of the aphids were put at my disposal. The present paper is based on this large material, and besides on the following: a type borrowed from the California Academy of Sciences, San Francisco; some type material obtained in exchange from the University of California, Berkeley; and a small collection borrowed from the British Museum (Natural History), London.

Three samples of alatae, each consisting of one or two specimens belonging to the difficult *Neuquenaphis edwardsi* group, have not been classified. Several samples of apterae from the most southern part of South America differ slightly from each other, but, as discussed sub *Neuquenaphis edwardsi* (Laing), the significance of the differences could not be determined.

History

Blanchard (1939) erected *Neuquenaphis* for *Myzocallis edwardsi* Laing, 1927. Essig (1953) described *Neuquenaphis michelbacheri* spec. nov. and *Neuquenaphis chilensis* spec. nov., and he also erected the genus *Spicaphis* for *Spicaphis michelbacheri* spec. nov. He thought it possible that *Spicaphis michelbacheri,* known only from one apterous viviparous female, was the same species as *Neuquenaphis chilensis,* known only from 3 alate

females, but this seems less probable after Dr. Schlinger collected the alate of presumably *Spicaphis michelbacheri* together with the apterous viviparous female. From this alata it is clear that *Spicaphis* Essig, type-species *Spicaphis michelbacheri* Essig, 1953, is a synonym of *Neuquenaphis* Blanchard, 1939. *Spicaphis michelbacheri* Essig, 1953, is mentioned in this paper under *Neuquenaphis essigi* spec. nov.

General morphology

In apterae body about 1.40—3.10 mm long, from rather slenderly pyriform to very broadly oval, not depressed. All or most of the dorsal hairs placed on elongate, somewhat scabrous processes which on top besides the hair have 4—5 spinules. The processes arranged as follows: 2 on the front each bearing 2 hairs, 0 to 6 on vertex each bearing 1 hair like all the other processes; on thorax and abdomen processes in spinal, pleural and marginal rows down to abdominal tergite VI or VII; tergite VIII with 2 processes; pronotum and abdominal tergite VII usually without pleural processes; in near-adult nymphs and sometimes in adult apterae a more or less complete row of processes between the pleural and marginal ones, the submarginal processes; exceptionally a number of small, rather irregularly placed, smaller processes between the usual rows, from mesonotum to abdominal tergite VII; in one species the spinal and pleural processes on the middle portion of the dorsum not or hardly developed, but the submarginal ones quite large. Sclerotisation of dorsum variable; mostly only the head sclerotic and more or less pigmented, sometimes the spinal, pleural and marginal processes on pigmented sclerotic plates that may fuse to more or less corrugated sclerotic transverse bars. Dorsal hairs in general very short, nearly always blunt, sometimes obovate or capitate, but those hairs that are not placed on processes usually longer and frequently subacute or acute. Underside of head mostly with 4—6 hairs in an oval just below the front, 2—4 more between the eyes; in one species in the apterous viviparous female with about 40 hairs. Front straight or slightly concave, often with a slight median bulge. Antennae of 6 segments with nearly always segment III longer than IV; the latter subequal to V, and longer than basal part of VI; processus terminalis not shorter, mostly very much longer than base of segment VI; antennal hairs variable in number, but remarkably uniform in shape, stiff, blunt to subacute at angles of about 40°, 1/5—1/2 of basal diameter of segment III long; secondary rhinaria absent; primary rhinaria with a fringe of tapering hairs. Eyes with many facets, with distinct triommatidium on the caudal side. Rostrum not much varying in length, reaching the middle coxae; ultimate segment always blunt with straight or convex sides, from shorter than its basal width to just over twice as long as its basal width, with 4—11 hairs besides the 3 subapical pairs. Legs rather stout, with about equal distances between coxa I, II, and III; all femora normal, about equally thick; tibiae in viviparae about cylindrical, in oviparae the hind tibiae swollen and with circular pseudosensoria, usually with a few very inconspicuous spinules between the hairs near apex; first tarsal joints dorsally very short, ventrally long, with a single row of spinules along most of the distal margin, with ventrally 1 short hair and mostly 6 long hairs; second tarsal joints with spinules or spinulose imbrications; empodial hairs sinuate near base, rod-shaped with slightly spathulate tip, narrow ribbon-shaped, or widening towards apex; claws normal. Siphunculi usually pigmented, truncated conical, to rather elongate in oviparae, with a usually wide flange, from smooth to slightly transversely reticulated near apex, always with one hair near base to halfway their length on anterior surface.

Cauda in apterae viviparae and oviparae divided into two parts by a very strong constriction; the apical portion or knob variable in shape, from spherical to bluntly cylindrical, sometimes pointed, with a considerable number of hairs often only laterally and on the underside. Subanal plate rather deeply incised in the middle. Subgenital plate normal, with several rows of rather long, acute hairs along posterior margin, and usually several hairs on its disc. The 4 rudimentary gonapophyses at equal distances, each with 2—3 hairs in apterae viviparae, but the middle pair fused to one with 5—6 hairs in oviparae. Oviparous female on sternites VI and VII with a pair of transverse, striate and punctate, very dark sclerotic plates that might be wax glands.

In alates body as large as in apterae viviparae, but much more slender. Mostly only the spinal and marginal hairs on abdomen on elongate processes, and all the other processes of apterae obsolete; normally the spinal processes of abdominal tergites I—III very long and thin, those on more posterior tergites, like the marginal ones quite short, and those on the last 3 tergites again longer; rarely either all spinal processes on abdomen of more or less equal length, or all hardly developed, or several additional dorsal processes present on thorax and abdomen. Head and thorax mostly pigmented, to black; abdomen with more or less pigmented intersegmental sclerites, sometimes with marginal sclerites and/or with sclerotic plates at the bases of the spinal processes. Dorsal hairs very different from those in apterae, up to 10 times as long, thorny or with fine apices, arranged as in apterae. Front always concave, with small frontal tubercles. Antennae much longer than in corresponding apterae; segment III with 1—30 rather narrow transversely oval rhinaria side by side near the middle of the segment or extending towards the apex from near the middle of the segment in alate females; rhinaria slit-like, very numerous and round about segments III, IV, V and base of VI in males; all secondary rhinaria ciliate, but sometimes the fringe of hairs incomplete or indistinct; processus terminalis comparatively longer than in apterae; primary rhinaria larger and with finer cilia than in apterae, with the accessory rhinaria on segment VI packed against the primary rhinarium; flagellum mostly nearly smooth on basal half of segment III, gradually more distinctly imbricated apicad. Legs long and slender; middle coxae very near the hind coxae and very far from the fore coxae; fore femora, except in one species, markedly incrassate and much thicker than the middle or hind femora, constricted laterally and dorsally just before the apex, dorso-apically strongly pigmented, and ventrally at the subapical constriction with a tooth; fore tibiae shaped like the other tibiae but with a bulge dorsally near the quite black base, the fore tibiae with 4, the middle tibiae with 3 or 4, the hind tibiae with 3 strong, tooth-like spines at apex, ventrally; first tarsal joints dorsally much longer than in apterae and there with 2 hairs, ventrally with 7 hairs. Wings all well developed, with normal venation, with mostly rather dark veins that may be distinctly bordered, or seemingly clear cut with under high power a very faint border, or with a very short border at the bases of the basal and cubital veins in which case the veins end in dark triangles. Siphunculi apparently implanted on a marginal sclerite that protrudes mediad, darker and more slender than in apterae, cylindrical in one male, nearly always very distinctly reticulated with isodiametric cells and a few rows of strongly transverse cells near apex or, in the male, over nearly their whole surface, with a very little developed flange. Cauda similar to that of apterae, but with more slender and more tapering knob. Other characters as in apterae.

First instar larvae or embryos as far as available with antennae of 5 segments, 2 frontal processes with bifid apices, 2 processes on vertex, a full complement of spinal, pleural

and marginal, but no submarginal processes to abdominal tergite VI, 4 processes on tergite VII, and 2 on tergite VIII; all these processes nearly smooth but for the spinulose apex, and with the same type and size of apical hairs as adult apterae; eyes with many facets; first tarsal joints spinulose, with 2 hairs ventrally; siphunculi absent.

Larger larvae always with distinct submarginal dorsal processes, from the second instar with siphunculi, and with the kind of hairs of apterae irrespective of the fact that they might develop into alatae.

SYSTEMATIC POSITION

The systematic position of *Neuquenaphis* is very interesting. Laing (1927) placed the type-species in *Myzocallis* Pass., i.e., in the Phyllaphidini. Essig (1953) put *Neuquenaphis* in the subfamily Callaphidinae, but *Spicaphis* in a new subfamily, the "Spicaphina". Börner & Heinze (1957) considered *Neuquenaphis* a member of the *Drepanosiphum* relationship. Heie (1967) wants to put *Neuquenaphis* together with *Sensoriaphis* Cottier in a particular tribe, not named, which he wants to assign to the Callaphididae sensu Börner, 1952, my Phyllaphidini. Clearly there is considerable agreement among these authors when the nomenclature they use is translated.

The material, especially that of first instar larvae and sexuales, at my disposal, could enhance further determination of the position of the genus. The structure of the curious sclerotic plates of oviparous *Neuquenaphis bulbicauda* spec. nov., apparently the same as what Cottier (1953, p. 102) described, suggests that *Sensoriaphis* Cottier, 1953 is very closely related.

Dorsal processes occur in widely different aphid genera, and therefore are of hardly any use for speculations on phylogeny. But the type of processes found in *Paoliella* Theobald and its relatives, with one minute apical hair and a number of spinules, rather strongly resembles that of *Neuquenaphis*. These African genera also have ciliate secondary rhinaria, no siphunculi in first instar larvae, and the adult's siphunculi show a hair on the anterior surface. The fore femora in alatae are frequently thickened though without a ventro-apical tooth. The tibiae have very few spinules. The empodial hairs are only at the apex thickened, and the number of rudimentary gonapophyses is usually four. However, the nymphs generally have no compound eyes, the head has a very marked V-shaped suture. Structurally the *Paoliella* group of genera apparently shows considerable resemblance to *Neuquenaphis*, and the differences should not be overestimated. It should be emphasized that in Phyllaphidini the occurrence of four rudimentary gonapophyses is very rare.

Chaitophorini do have four rudimentary gonapophyses. The reticulated siphunculi of *Neuquenaphis* remind one immediately of *Periphyllus* v. d. Hoeven and *Chaitophorus* Koch, though in those genera there is no hair on the siphunculi. Their empodial hairs resemble those of *Neuquenaphis*. But there are no dorsal processes, and the secondary rhinaria have no cilia around them. First instar larvae without siphunculi are found in some *Periphyllus* spp.

The Drepanosiphini have three rudimentary gonapophyses, like the ovipara of *Neuquenaphis bulbicauda* spec. nov. They often have a curious, pigmented chitinous structure caudad of the genital porus (as depicted in Davatchi, Hille Ris Lambers & Remaudière, 1957, p. 126, fig. 5), and traces of this are refound in *Neuquenaphis*. The

fore femora of alate Drepanosiphini are just like those of alate *Neuquenaphis*, incrassate, with a subapical constriction, and with a ventro-apical tooth. Siphunculi have no hair, but in one case, *Yamatocallis takagii* Tak., there is some reticulation not unlike that in *Neuquenaphis schlingeri* spec. nov. First instar larvae invariably show siphunculi. Dorsal processes are at least in one genus common in alatae, though never in apterae of larvae.

Apparently *Neuquenaphis* is a very controversial genus. The oviparae have a structure that may be some unusual type of subsiphuncular wax gland. The dorsal processes and several other features resemble those of the African *Paoliella*-like genera, but the latter have in alatae a distinct V-shaped ridge in the head capsule, and rather different fore femora.

Several characters are as in Chaitophorini, but the fore femora are typically like those in Drepanosiphini. The host plants, *Nothofagus* spp. belong to a rather primitive plant order, many genera of which are infested by Phyllaphidini, but they are not known to be inhabited by Chaitophorini or Drepanosiphini (sensu H.R.L.). In fact, it is impossible to be positive about the position of *Neuquenaphis*, but it could be fitted into Heie's (1967) phylogenetic tree at a point where his Callaphididae (my Phyllaphidini) separate from his Chaitophoridae (my Chaitophorini). This tree should then be modified so, that first the Phyllaphidini are split from the ancestors of the Neuquenaphidini, after which the Drepanosiphini and Chaitophorini branch from the Neuquenaphidini. The alternative to this speculation seems to be, that Chaitophorini, Phyllaphidini, Neuquenaphidini, Paoliellini and Drepanosiphini are lumped together.

Biology

All known species of the genus live on trees of the genus *Nothofagus* Blume in South America, according to Dr. Schlinger on the undersides of the leaves. Dr. Schlinger collected most species on *Nothofagus obliqua*, some on *N. dombeyi*, and one on *N. antarctica*. Some of the unidentified samples came from *Nothofagus* sp. on Tierra del Fuego where also *N. betuloides* and *N. pumilio* occur.

The life history of the various *Neuquenaphis* species has not been investigated, and the material at hand does not offer many clues. In *N. essigi, N. edwardsi, N. palliceps* and *N. schlingeri* the simultaneous occurrence of apterous and alate viviparae is known, and one may assume that this also occurs in *N. bulbicauda* and *N. similis*. But in *N. michelbacheri, N. sensoriata*, and *N. flavipes*, of which many alatae were collected, apterae either do not occur simultaneously with alatae, or they are very rare. Nothing points to the existence of alate fundatrices.

So far sexuals, several oviparae and an alate male, are only known in *N. bulbicauda*, and they were collected on Februari 6, the equivalent of August 6 on the northern hemisphere, i.e., very early in the year. There is a possibility that the apterae viviparae collected before and simultaneously with the oviparae are fundatrices as they contain embryos with the type of hairs found on the oviparae but different from those found on the apterae viviparae. That would suggest a very unusual life cycle, consisting of only two generations, as may occur in certain arctic aphids.

Dr. Cottier told me that in *Sensoriaphis sensoriata* Cottier the oviparae do not lay ellipsoid eggs as all other oviparae do, but disc-shaped eggs. Unfortunately the oviparae of *Neuquenaphis* at my disposal contain no eggs.

KEY TO THE SPECIES

a. Alate viviparous females.

1 (2) Dorsal spinal processes on the anterior 5 or 6 abd. tergites not developed, not longer than their half-way width. Processus terminalis much longer than ant. segment III. Siphunculi not with distinct reticulation, only with 2—3 rows of very strongly transverse cells near apex. On *Nothofagus obliqua* . . . . . *N. schlingeri* spec. nov.

2 (1) Dorsal spinal processes at least on abd. tergites I—III well developed and some of these several times as long as their half-way width. Processus terminalis usually shorter than ant. segment III. Siphunculi with several rows of more or less isodiametric cells, rarely not reticulated.

3 (6) Vertex with at least 4 elongate hair-bearing processes. Cauda with the knob not or hardly longer than wide, roundish.

4 (5) Fore wings with all the veins bordered with brown. Mesonotum with 6 long hair-bearing processes. Processes in posterior row on vertex much longer than their half-way diameter. Fore femora 1½ times as thick as other femora. On *Nothofagus dombeyi* (?) . . . . . *N. chilensis* Essig

5 (4) Fore wings with clear-cut veins. Mesonotum with 4 long hair-bearing processes. Processes in posterior row on vertex not longer than their half-way width. Fore femora twice as thick as other femora. On *Nothofagus dombeyi* (?), *N. obliqua* . . . . . *N. essigi* spec. nov.

6 (3) Vertex without or with two hair-bearing processes; also those on the front sometimes developed. Sometimes the basal vein in the fore wings very faintly bordered, but not the others. Knob of cauda mostly much longer than its largest width, tapering.

7 (8) Processus terminalis more than 1 mm long, 5½—7¼ times as long as basal part of ant. segment VI. Ant. segment III with only 1—6 rhinaria. Head pale honey-coloured with dark to black rings around the ocelli. Last rostral segment not or hardly longer than its basal width, very blunt. On *Nothofagus dombeyi*. . . . . *N. palliceps* spec. nov.

8 (7) Processus terminalis less than 1 mm long, rarely more than 5 times as long as basal part of ant. segment VI. Ant. segment III usually with more than 5 rhinaria. Last rostral segment much longer than its basal width.

9 (10) Fore femora not noticeably thicker than the other femora. Pleural processes on abdominal tergites I—VII distinct, mostly longer than their half-way width. Fore wings covered with very fine scales with the exception of an elongated field between wing base and basal vein. Last rostral segment divided by a mostly colourless, constricted zone into two parts of which the distal one is hairless. On *Nothofagus dombeyi* . . . . . *N. bulbicauda* spec. nov.

10 (9) Fore femora much thicker than the other femora. Pleural processes on abdomen not developed. Fore wings with large fields without any scales. Last rostral segment not subdivided.

11 (12) Processus terminalis short, only 2—3⅙ times as long as basal part of ant. segment VI. Ant. segment III with 12—30 rhinaria. Last rostral segment with 13—18 hairs. On *Nothofagus obliqua* . . . . *N. sensoriata* spec. nov.

12 (11) Processus terminalis 3¼—5½ times as long as basal part of ant. segment VI. Ant. segment III with 3—15 rhinaria. Last rostral segment very exceptionally with more than 12 hairs.

13 (14) Antennae 1⅖—1⅔ times as long as body. Ant. segment III with 9—15 rhinaria. Dorsal processes on abd. tergites I—III completely unpigmented. On *Nothofagus obliqua* and perhaps *N. dombeyi* . . *N. michelbacheri* Essig

14 (13) Antennae 1¼—1½ times as long as body. Ant. segment III with 3—9 rhinaria. Dorsal processes on abd. tergites I—III brownish, often on dark sclerotic plates without a paler centre.

15 (16) Hind femora not, or only just visibly darker than the fore femora. On *Nothofagus obliqua* . . . . . *N. flavipes* spec. nov.

16 (15) Hind femora very much darker than fore femora. On various *Nothofagus* spp. Complex of . . . . . *N. edwardsi* (Laing)

b. Apterous viviparous females.

1 (2) Head with only 2, frontal, dorsal processes. Abdomen only at the periphery with long processes, the spinal ones absent or very short. On *Nothofagus obliqua* . . . . . *N. schlingeri* spec. nov.

2 (1) Head with at least 4 long processes, on the front and on vertex. Spinal processes not much shorter than the marginal ones.

3 (6) Head on vertex with a transverse row of 4 rather long processes. Abdominal tergite VII usually with 6 processes. Processus terminalis mostly less than 1½ times as long as basal part of ant. segment VI.

4 (5) Cauda with a globular or transversely oval knob. Hairs on top of the dorsal processes all knobbed with cylindrical shaft. On *Nothofagus obliqua* and perhaps *N. dombeyi.* (*?Spicaphis michelbacheri* Essig) . *N. essigi* spec. nov.

5 (4) Cauda with the knob often not longer than its maximum width, but then with a rather acute conical apex. At least part of the hairs on the dorsal processes sessile, shaped like a stratosphere balloon, at least 0.008 mm thick. On *Nothofagus dombeyi* . . . . . *N. bulbicauda* spec. nov.

6 (3) Head with two long processes on vertex between the eyes. Abdominal tergite VII with only 4 processes. Knob of cauda always elongated.

7 (8) Last rostral segment very blunt, not or hardly longer than its basal width. On *Nothofagus dombeyi* . . . . . *N. palliceps* spec. nov.

8 (7) Last rostral segment more than 1⅓ times as long as its basal width.

9 (10) Body large, more than 2.50 mm, antennae about 1½ times as long as body. All hairs on top of dorsal processes distinctly capitate or with striate, enlarged apex, comparatively long; those on the spinal processes of abdominal tergites I—III 0.013—0.020 mm long. Embryos with dorsal hairs of up to 0.013 mm long, capitate. On *Nothofagus obliqua* . . . . . *N. similis* spec. nov.

10 (9) Body very rarely up to 2.40 mm long, but then antennae not or hardly longer than body. Hairs on dorsal processes sometimes with swollen apices, but usually the apex still thinner than the base of the hair. Embryos with dorsal hairs of less than 0.004 mm, usually much shorter than the spinules on the processes. On various *Nothofagus* spp. Complex of . . . . . *N. edwardsi* (Laing)

DESCRIPTIONS OF THE SPECIES

Neuquenaphis bulbicauda spec. nov.

(Plate 15, figs. 5—8; Plate 17, fig. 16; Plate 18, fig. 17)

Alate viviparous female (from one specimen).

Head and thorax blackish sclerotic; abdomen with inconspicuous brownish intersegmental sclerites, and with distinct dark, spinal, pleural and marginal sclerites on which the dorsal processes are placed. Processes on the front about as long as the hairs on their top, waisted; vertex with two processes about as long as wide; pronotum with 4 spinal, mesonotum with two distinct spinal ones slightly longer than their half-way width; mesonotum with two spinal ones 2—3 times as long as their half-way width; abdomen with the spinal processes gradually shorter from tergite I, where they are 8—10 times as long as their half-way width, to tergite VIII; pleural processes on tergites I—VII very distinct, as long as or longer than their half-way width, and longer than the more conical marginal and submarginal ones. Hairs on top of the processes thorny, rather acute, about 0.014—0.018 mm long. Antennae brown; segments III near their middle with 3 and 4 transversely oval, distinctly ciliate rhinaria; last rostral segment about 0.09 mm long, hairs broken, but probably 5 hairs present besides the 3 subapical pairs. Legs with the femora all about equally dark, tibiae paler; fore femora about 0.07 mm wide, at most $1^1/_{10}$ times as thick as the middle femora, with a not conspicuous ventro-apical tooth; hind tibiae with some 15—20 spinules near apex; second tarsal joints distinctly spinulose; empodial hairs bent, linear. Wings with normal venation, veins not bordered and not with dark triangles at their tips; surface of fore wings evenly scaly. Siphunculi smooth, rather cylindrical distally, markedly reticulated with 4—5 rows of isodiametric cells and a few rows of transverse cells. Cauda paler than siphunculi, with the more or less triangular knob about $1^1/_8$ times as long as its basal, largest, width.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Rhin. on III	Siph.	Cau.
1	1.81	2.44	0.60	0.49	0.43	0.14 + 0.63	3 & 4	0.13	0.17

(from *Nothofagus dombeyi,* 8 km W. of La Picada, El Refugio, Volcan Osorno (Osorno), 6.II.'67, leg. E.I.S. 67-2-6c).

Apterous viviparous female.

Body about 2.25—3.10 mm long, very broadly oval, about $2^1/_2$ times as long as wide. Anterior part of head blackish brown sclerotic, posterior part pale; thorax rather pale; abdomen pale, with blackish brown intersegmental sclerites, not with sclerites at the base of the dorsal processes. The latter numerous; head with 2 on front, and 4 in a transverse row between the eyes; pronotum with 4 spinally, 2 marginally; mesonotum with 4 spinally, 4 marginally; metanotum like abd. tergites I—IV with 2 spinally, 2 pleurally, 2 submarginally, 2 marginally; tergites V—VI without the submarginal ones; tergite VIII only with 2 spinal ones, and with 2 small hairs not on processes; all the processes thick and short, $2^1/_2$—4 times as long as their half-way width, with very broad bases, the spinal

ones on abdomen from 0.050 mm (tergite I) to 0.13 mm (tergite VII) long; all blackish brown with pale bases, bluntly imbricated with blunt apical spinules; submarginal processes hardly shorter than the marginal ones. Hairs on top of the processes variable, from rod-shaped on the front, to often almost stem-less, capitate, often with very thick oboval knob of up to 0.008 mm wide on abdomen. Antennae in the available specimens only $^1/_3$—$^3/_7$ of length of body, with blackish brown basal segments; flagellum brownish yellow at base, blackish brown towards apex, bluntly imbricated; processus terminalis 1—1⅓ times as long as basal part of segment VI; hairs on segment III rather erect and spiny, about 0.015 mm long; primary rhinaria small, indistinctly fringed or rather combed with strongly tapering hairs. Ventral side of head with very numerous, about 60, hairs, in strong contrast to the normal number of ventral hairs elsewhere. Rostrum reaching just past hind coxae; last segment about 0.30 mm long; with a subapical membranous constriction separating a blackish apical hairless part; hairs on basal half at least partly fine, up to 0.040 mm long, 3—5 in number (besides the 3 subapical pairs). Legs short, stout, thick-walled, yellowish brown with the femora dorso-apically, the tibiae at base dorsally and at apex blackish brown, with numerous rather spiny, partly bluntish hairs of about 0.035 mm long; tarsi not spinulose, not distinctly imbricated; empodial hairs rather thickly rod-shaped with spathulate tip. Siphunculi blackish brown, rather slender, very indistinctly transversely reticulated with 3—4 distinct rows of cells at apex, with wide flange; subbasal hair club-shaped, stout, about 0.009 mm long. Cauda very dark, markedly knobbed; the knob onion-shaped, with acute apex, hardly longer than its greatest width, with numerous hairs.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Siph.	Cau.
1	2.33	1.01	0.27	0.17	0.15	0.10 + 0.14	0.11	0.21
2	3.00	1.05	0.26	0.19	0.16	0.11 + 0.15	0.13	0.27
3	2.76	0.97	0.26	0.18	0.14	0.09 + 0.14	0.13	0.23
4	2.67	1.16	0.32	0.22	0.16	0.11 + 0.16	0.14	0.28
5	2.57	0.96	0.23	0.15	0.14	0.10 + 0.15	0.11	0.22
6	3.06	1.11	0.30	0.19	0.16	0.13 + 0.14	0.13	0.30

(1, from *Nothofagus dombeyi*, 8 km E. of Pucon (Cautin), Chile, 9.II.'67, leg. E.I.S. 67-2-9c; 2, from *Nothofagus dombeyi,* 2 km SW. of Villarica (Cautin), Chile, 18.XII.'66, leg. E.I.S. 66-12-18a; 3, from *Nothofagus dombeyi*, 20 km E. of Caramavida (Arauca), Chile, 31.I.'67, leg. E.I.S. 67-1-31c; 4, from *Nothofagus dombeyi*, 35 km W. of Angol (Malleco), Chile, 12.II.'67, leg. E.I.S. 67-2-12b; 5, from *Nothofagus dombeyi*, 18 km W. of Angol (Malleco), Chile, 10.II.'67, leg. E.I.S. 67-2-10d; 6, from *Nothofagus* sp., Puerto Eden, Wellington Island (Magallanes), Chile, 4.XII.'58, leg. Kuschel, BMNH no. 40/60).

Oviparous female.

Rather like apterous viviparous female, but more elongated, much smaller, 1.50—1.90 mm long. Dorsal processes much more slender, longer, spinal ones on abd. tergite I 0.11 mm, on tergite VII 0.16 mm, to 9 times as long as their half-way width; abd. tergite VII with only 4 processes. All hairs on the tops of dorsal processes sessile and balloon-shaped,

0.010 mm thick. Antennae ½—⅔ of length of body; processus terminalis about 1½ times as long as base of segment VI; hairs on segment III at most 0.004 mm long, blunt. Underside of head with only 6 hairs, as normal. Last rostral segment as in preceding morph. Legs more slender, rather evenly brownish yellow, with straight tibiae; hind tibiae half-way about 1½ times as thick as the other tibiae, with on the inner side about 40—50 somewhat tuberculate pseudosensoria of 0.004—0.007 mm diameter; second tarsal joints with some spinules. Siphunculi rather dark brownish, slender, on the large flange with some coalescing transverse lines; subbasal hair club-shaped, placed in a shallow, flat pit. Cauda very different, dark, with the acorn-shaped, blunt knob 1½ times as long as its largest width. Caudad and mediad of each of the (ventral) abdominal stigmal pori of segments VI and VII very dark brownish black sclerites which are densely striate, the striae apparently consisting of very dense rows of minute pin-pricks, but in profile these sclerites completely smooth. Rudimentary gonapophyses rather distinctly 3, but the middle one with twice as many chaetae as the lateral ones. Subgenital plate roundish, evenly hairy.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Siph.	Cau.
1	1.55	0.96	0.26	0.15	0.15	0.11 + 0.16	0.12	0.20
2	1.85	0.97	0.29	0.16	0.13	0.10 + 0.15	0.14	0.26
3	1.81	0.94	0.26	0.15	0.14	0.11 + 0.15	0.14	0.20
4	1.52	0.95	0.27	0.14	0.14	0.11 + 0.16	0.14	0.21

(no. 1—4, from *Nothofagus dombeyi*, 8 km W. of La Picada, El Refugio, Volcan Osorno (Osorno), Chile, 6.II.'67, leg. E.I.S. 67-2-6c).

Alate male (from one specimen).

Body 1.29 mm long. Head and thorax blackish brown sclerotic; abdomen without local sclerotisation or pigmentation. Dorsal processes on head and thorax not developed, on abdomen only spinally present, the longest on tergite I 0.030 mm long, the rest shorter, all more or less similar in size, and less than 0.022 mm long; all pale or vaguely brownish. Antennae blackish brown, segments III—V and base of VI covered round about with short, slit-like, much protruding, ciliate rhinaria. Underside of head with 6 hairs. Last rostral segment 0.10 mm long, structurally as in apterae viviparae but with only 2 hairs of 0.016 mm besides the 3 subapical pairs. Legs dark throughout; fore femora not thicker than hind femora, ventrally with a normal apex; hind tibiae with more than 20 spinules near apex, the other tibiae without spinules; first tarsal joints of fore and middle legs only with some spinules along the ventral margin, but those of hind legs like all the second joints with many spinules over their whole surface. Wings with pale brown, normal venation, evenly covered with small scales with the exception of a rather narrow zone near posterior margin between basal vein and basis of wing. Siphunculi dusky, cylindrical with suddenly expanded base, the cylindrical part more than twice as long as wide, with coarse isodiametric or even longitudinal reticulation from tip to base; subbasal hair broken or absent. Cauda paler than siphunculi, strongly knobbed, the knob very slender, blunt, 0.091 mm long, 0.040 mm wide. Genitalia apparently normally developed.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Rhin. on segment III	IV	V	VI	Siph.	Cau.
1	1.29	2.04	0.61	0.41	0.30	0.14 + 0.46	69 & 72	36 & 31	14 & 16	5 & 3	0.12	0.13

Discussion. It would not have been possible to believe that the oviparae described here were conspecific with the apterae viviparae if the latter did not contain embryos. For these embryos clearly show hairs in the shape of a stratosphere balloon of the same type as those found on the dorsal processes of the oviparae, and almost equally thick. In the sample with oviparae there was one very mouldy aptera vivipara that was not measured, and that also shows the very hairy underside of the head present in the other viviparae.

The male and alata described above differ even more from the apterae viviparae, but they belong here unless there is still another *Neuquenaphis* on *Nothofagus dombeyi* of which no other morph or nymph was collected. The fore femora are not enlarged and nearly lack the ventro-apical process. The fore wings are evenly covered with small scales whereas in nearly all other species of which alatae are available these scales occur in a very distinct pattern, and are completely absent elsewhere. Therefore I could not associate the male and the alate female with one of the other species. The main reason for considering them conspecific with *N. bulbicauda* is in the structure of the last rostral segment, which is like that of the apterae viviparae and the oviparae.

The apterae viviparae are almost certainly very old specimens, but they may well be fundatrices. If this is right, this species is unique among aphids in having only two generations per annum, for these apterae seem to produce the oviparae, and, presumably, the males. The few nearly adult nymphs in the sample by their structure appear to be young oviparae.

Types. Holotype: Apterous viviparous female (no. 2 of measurements), from *Nothofagus dombeyi*, 2 km SW. of Villarica (Cautin), Chile, 18.XII.'66, leg. E. I. Schlinger no. 66-12-18a. Paratypes: 1 apterous viviparous female, from *Nothofagus dombeyi*, 8 km E. of Pucon (Cautin), Chile, 9.II.'67, leg. E. I. Schlinger no. 67-2-9c; 1 aptera vivipara, from *Nothofagus* sp., Puerto Eden, Wellington Island (Magallanes), Chile, 4.XII.'58, leg. Kuschel, BMNH no. 40/60; 1 aptera vivipara, from *Nothofagus dombeyi*, 20 km E. of Caramavida (Arauca), Chile, 31.I.'67, leg. E. I. Schlinger no. 67-1-31c; 1 aptera vivipara, from *Nothofagus dombeyi*, 35 km W. of Angol (Malleco), Chile, 12.II.'67, leg. E. I. Schlinger no. 67-2-12b; 1 aptera vivipara, from *Nothofagus dombeyi*, 18 km W. of Angol (Malleco), Chile, leg. E. I. Schlinger no. 67-2-10d; 1 damaged aptera vivipara, 1 alate male, 1 alate female, and 6 oviparae, from *Nothofagus dombeyi*, 8 km W. of La Picada, El Refugio, Volcan Osorno (Osorno), Chile, 6.II.'67, leg. E. I. Schlinger no. 67-2-6c.

Neuquenaphis chilensis Essig, 1953
(Plate 18, fig. 18)

1953. Essig, E. O., Proc. Calif. Acad. Sc. (IV) 28 : 67—69, *Neuquenaphis chilensis.*

Alate viviparous female.

Body about 2.20 mm long. Head and thorax dark sclerotic; abdomen only with vague, small intersegmental sclerites and rather pale marginal sclerites. Head with 2 frontal

processes of about 0.060 mm each with 2 hairs, 2 more posterior ones of about 0.040 mm, and a row of 4 on vertex of about 0.025 mm long; pronotum with 4 spinal processes of about 0.090 mm and 2 pleural ones of about 0.074 mm; mesonotum with 4 spinal ones of about 0.090 mm, and 2 between the posterior spinal ones of about 0.060 mm; metanotum with 4 in a row of about 0.027 mm; abdominal tergite I only with 2 spinal ones of about 0.078 mm, and thick, conical marginal and submarginal ones of about 0.026 mm; tergites II—VII with an unpaired, variable (0.013—0.035 mm long) median process, 2 spinal processes of 0.043—0.078 mm, occasionally very small pleural processes, and rather distinct, thickly conical, marginal and submarginal processes. Hairs on top of the processes nearly all very blunt, about 0.016 mm long, sometimes with tapering, sometimes with incrassate apices. Antennae about $^6/_7$ of length of body, with very dark basal segments, and yellowish, apicad dark, flagellum; segment III on the middle fourth part with 6 transversely oval, markedly ciliate rhinaria; hairs on segment III rather numerous, about half as long as diameter of the segment at its strongly constricted base. Rostrum with the more or less elongated acorn-shaped ultimate segment faintly tapering towards base, more strongly towards apex, about 0.11 mm long, not constricted distad the subapical hairs, with 5 hairs besides the 3 subapical pairs. Femora brown, tibiae paler; fore femora paler than the other femora, in the middle about 0.105 mm thick, about 1½ times as thick as the middle femora; apices of hind tibiae with very few, 5—8, spinules; second tarsal joints not very spinulose. Wings with normal venation, evenly scaly; veins dark smoky, all broadly but very vaguely bordered with very pale brown, with distinct brown triangles at their apices. Siphunculi dark, truncated conical, completely smooth, with wide flange; subbasal hair on a tubercle, at apex thicker than at base. Cauda dark, with the knob nearly spherical, about as long as its largest width.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Rhin. on III	Siph.	Cau.
1	2.19	1.89	0.60	0.40	0.30	0.17 + 0.25	6 & 6	0.09	0.16

(1, holotype, "beating at Hacienda San Andrès, Paranque, Chile, Jan. 15, 1957, A. E. Michelbacher").

Discussion. Through the kindness of Dr. P. H. Arnaud I could examine the type of this species. The species was described from three specimens, from *Nothofagus dombeyi,* Purranque, Osorno, but the paratypes were out on loan and could not be examined.

It appears to be very closely related to *N. essigi* spec. nov., but there are marked differences in the number and sizes of the processes on the head and the mesonotum, in the shapes of the hairs on top of the dorsal abdominal processes, in the sculpture of the siphunculi, and in the shape of the secondary rhinaria, the latter being much more strongly transverse in *N. essigi* than they are in *N. chilensis.* From Essig's figure one gets the impression that the veins in the wings are heavily bordered, but this is not so marked. However, the alate specimen of *N. essigi* happens to be very much darker after clearing than the type of *N. chilensis,* and therefore the banded veins would seem to be a reliable difference.

Presumably also *N. chilensis* must have an apterous morph, and if this is true, it may be very difficult to distinguish it from that of *N. essigi.* In fact, there is reasonable doubt

whether the insect described here intentionally as a new species under the name *N. essigi* is really the same as *Spicaphis michelbacheri* Essig, the single existing specimen of which could not be examined. It is not impossible that *Spicaphis michelbacheri* Essig, 1953, is really a synonym of *N. chilensis* Essig, 1953. It is, however, clear, that *N. essigi* spec. nov. is not a synonym of *N. chilensis*.

Type. Holotype: Alate viviparous female, beaten from presumably *Nothofagus dombeyi*, Purranque (Osorno), Chile, 15.I.'51, leg. A. E. Michelbacher. Paratypes: 2 alate viviparae with data as for holotype.

Neuquenaphis edwardsi (Laing, 1927)
(Plate 17, figs. 13, 15)

1927. Laing, F., Rev. Soc. Ent. Argentina 2 : 23—24, *Myzocallis edwardsi*.
1939. Blanchard, E. E., Physis (Buenos Aires) 17 : 880—881, *Neuquenaphis edwardsi* Laing.

Alate viviparous female [1]).

Body about 1.85—2.35 mm long. Head and thorax almost black; abdomen with small, blackish, intersegmental sclerites and with slightly paler marginal, pleural, and spinal hair- or process-bearing sclerites, of which the marginal ones are the largest, the pleural ones the smallest and vaguest. Processes on front, pronotum and mesonotum very rarely developed; those on abd. tergites I, II and III dark, cylindrical, often constricted near base, to 0.075 (0.097) mm long and about 7 times as long as their half-way width; sometimes also tergite IV with rather tall processes, those on more posterior tergites normally short, often shorter than wide, but those on VII and VIII again longer; hairs on top of spinal processes of tergites I—III 0.016—0.022 (0.021—0.045) mm long, very nearly acute, to very acute. Antennae 1⅓—1⅖ (1¼—1½) times as long as body; brownish to dark brown, gradually darker towards apex, with the very base of segment III quite pale and the part bearing the rhinaria always just darker than the part basad; segment III at or just basad the middle with a very compact row of 3—8 (3—9), rarely 2, strongly transverse rhinaria with conspicuously long (0.0045—0.005 mm) cilia; processus terminalis not more than 0.75 (0.67) mm long, 3⅔—5¼ times as long as base of segment VI. Last rostral segment about 0.10 mm long, at base just over half its length, with 4—6 hairs besides the 3 subapical pairs. Legs brownish yellow to yellowish brown, but always with the middle and especially the hind femora very much darker to black, darker than the siphunculi; maximum width of fore femora about 0.11—0.13 mm, length about 0.60 mm; hind tibiae with more than 10 spinules near apex; second tarsal joints spinulose. Wings with normal venation; veins brown, seemingly clear cut, but at least the basal vein under high power very faintly and narrowly bordered; none of the veins with even a trace of dark triangles at their tips. Siphunculi dark, reticulated with about 4—5 rows of more or less distinctly isodiametric cells and 3—4 rows of strongly transverse cells; subbasal hair about 0.022 (0.026—0.039) mm long. Cauda dark, but paler than the siphunculi, with the rather slender, blunt knob 1⅔—2 (1½—1⅔) times as long as its largest width.

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[1]) If for an organ two sets of figures are given, the one between brackets refers to southernmost material.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Rhin. on III	Siph.	Cau.
1	2.02	2.77	0.79	0.59	0.51	0.15 + 0.56	5 & 6	0.14	0.19
2	1.92	2.63	0.76	0.54	0.46	0.14 + 0.56	5 & 6	0.11	0.16
3	2.03	2.86	0.82	0.60	0.49	0.13 + 0.66	4 & 5	0.11	0.19
4	1.97	2.89	0.83	0.55	0.51	0.15 + 0.68	4 & 6	0.11	0.21
5	2.22	2.88	0.76	0.57	0.54	0.15 + 0.68	5 & 6	0.11	0.20
6	1.96	2.82	0.82	0.50	0.46	0.14 + 0.73	4 & 4	0.12	0.18
7	2.04	2.85	0.80	0.55	0.48	0.15 + 0.69	3 & 4	0.11	0.21
8	1.99	2.89	0.77	0.54	0.46	0.16 + 0.58	3 & 4	0.10	0.19
9	1.91	2.83	0.84	0.55	0.47	0.14 + 0.67	4 & 6	0.11	0.16
10	2.23	2.83	0.82	0.56	0.49	0.17 + 0.60	6 & 6	0.10	0.18
11	2.25	3.02	0.90	0.62	0.53	0.16 + 0.67	6 & 8	0.12	0.18
12	1.86	2.62	0.77	0.51	0.40	0.14 + 0.64	7 & 9	0.10	0.17
13	2.19	2.73	0.79	0.53	0.49	0.14 + 0.61	8 & 8	0.11	0.17

(1—2, paratypes, from *Nothofagus* sp., Bariloche (Neuquen), Argentine, 1.XIII.'26, leg. F. W. Edwards; 3—4, from *Nothofagus obliqua*, 35 km W. of Angol (Malleco), Chile, 12.II.'67, leg. E.I.S. 67-2-12a; 5—6, from *Nothofagus glauca* or *obliqua*, 12 km W. of Cuesta Santa Julia (Rio Negro), Argentine, 17.XII.'66, leg. E.I.S. 66-12-17b; 7, from *Nothofagus glauca* or *obliqua*, Las Trancas (Nuble), Chile, 15.II.'67, leg. E.I.S. 67-2-15b; 8, from *Nothofagus antarctica?*, Laguna Amarga (Magallanes), Chile, 7.XII.'66, leg. E.I.S. 66-12-7a; 9—13, from *Nothofagus* sp., Puerto Williams, Navarino Isl. (Tierra del Fuego), Chile, I-'59, leg. Kuschel).

Apterous viviparous female.

Body pear-shaped, about 2.00—2.50 mm long. Tergum mostly with head brownish sclerotic, abdomen with vague brownish transverse bars bearing the spinal and pleural processes and with marginal brownish sclerites, or quite pale. Submarginal processes either absent, or very erratically one of only ¼ the length of nearest marginal processes present. All processes more or less pigmented, from just brownish to blackish brown, mostly rather curved, slender, the spinal ones of abd. tergite III, e.g., 8—10 times as long as their half-way width, and about 0.13 mm long; their apical hairs on a specimen and between specimens variable in length and shape, sometimes very short (0.004 mm) hairs markedly capitate, but longer hairs on the same specimen cylindrical; in some samples all hairs on spinal processes of abd. tergites I—III very short (0.003—0.006 mm), sometimes all these hairs over 0.009 mm long. Antennae $^{9}/_{10}$—$1^{1}/_{10}$ times length of body, in one specimen (fundatrix?) ⅔ of length of body, pale with basal segments and apex darkish, from basal ⅓ part of segment III apicad gradually more distinctly imbricated; processus terminalis $3^{1}/_{4}$—$3^{3}/_{4}$ times length of base of segment VI, but in one specimen (fundatrix?) only $2^{2}/_{3}$ times base of segment VI; in one specimen 2 & 3 roundish rhinaria present on ant. segment III. Rostrum mostly reaching past middle coxae; last segment mostly twice or more times as long as its basal width, about 0.11—0.12 mm long, with 4—6 hairs besides the 3 subapical pairs. Legs rather short, with the pigmentation correlated with the sclerotisation of dorsum; coxae and femora from pale brownish to blackish brown; tibiae evenly pale, to blackish apically, near apex with some spinules, often in transverse rows. Siphunculi dark to black, volcano-shaped with wide, thick flange, short, smooth with two rows of more or less complete, very strongly

transverse reticulations on the flange. Cauda rather dark, variable as to shape of knob which is 1⅔—2⅕ times as long as its largest width in most specimens.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Siph.	Cau.
1	2.13	1.91	0.48	0.33	0.31	0.13 + 0.47	0.12	0.26
2	2.42	1.68	0.45	0.30	0.27	0.14 + 0.36	0.13	0.27
3	2.10	1.82	0.47	0.32	0.28	0.13 + 0.45	0.13	0.26
4	2.10	2.03	0.54	0.37	0.34	0.15 + 0.45	0.14	0.24
5	2.25	2.07	0.50	0.38	0.38	0.15 + 0.47	0.12	0.26
6	2.06	2.12	0.57	0.35	0.35	0.14 + 0.50	0.11	0.22
7	2.36	2.13	0.59	0.39	0.36	0.14 + 0.46	0.13	0.26
8	2.19	2.20	0.52	0.40	0.38	0.15 + 0.56	0.13	0.24

(1, from *Nothofagus antarctica*, Laguna Amarga (Magallanes), Chile, 7.XII.'66, leg. E.I.S. 66-12-7a; 2—5, from *Nothofagus* not *antarctica*, 35 km S. of Estancia Cameron (Tierra del Fuego), Chile, 2.XII.'66, leg. E.I.S. 66-12-2d; 6, from *Nothofagus antarctica?*, 27 km N. of Punta Arenas (Magallanes), Chile, 27.XI.'66, leg. E.I.S. 66-11-27a; 7—8, from *Nothofagus* sp., Puerto Williams, Navarino Island (Tierra del Fuego), Chile, I.'59, leg. Kuschel BMNH 39/60).

Discussion. Through the kindness of Dr. V. F. Eastop I could examine two paratypes. These have fewer secondary rhinaria than mentioned in the original description.

Alatae of *edwardsi* strongly resemble those of *N. flavipes* spec. nov. but they differ by the dark hind femora which usually are much darker than the fore femora. Specimens that have been treated too long in KOH, or teneral specimens, cannot be distinguished with certainty from alatae of *N. flavipes* spec. nov.

Alatae from the area from which F. Laing described the species agree excellently with the type material. But specimens collected from *Nothofagus* species other than *obliqua*, on Tierra del Fuego, are less certainly *N. edwardsi* (Laing). They show on an average longer dorsal hairs, and a great variation in the development of the dorsal processes. In some specimens nearly all the spinal processes are very elongated.

The apterae that have been described here as *N. edwardsi* may belong to several similar species of which only the alatae were described. These apterae show a last rostral segment of 0.11—0.12 mm long except in one specimen in which they are 0.10 mm, and a very great variation in pigmentation, from a uniformly pale dorsum to brown transverse bars across the abdominal tergites. Such dark specimens differ from pale specimens by having longer dorsal hairs. In one sample from *Nothofagus antarctica* the cauda is thicker than in the others. The second aptera measured has rather shorter antennae, and it might be a fundatrix. Careful study of embryos did not give an answer to the question whether the observed differences are differences between clones, or differences between taxa.

The alate material collected in the type area suggests that *Nothofagus obliqua* is really a hostplant. In other samples containing alatae there is no certainty about the host species. Dr. S. J. van Ooststroom informed me that *Nothofagus obliqua* has been recorded from Tierra del Fuego besides *N. antarctica, N. betuloides,* and *N. pumilio.*

Types. Holotype: Alate viviparous female, from *Nothofagus* sp., Bariloche (on the label Bauloche, perhaps meant San Carlos de Bariloche?) (Neuquen), Argentine,

1.XII.'26, leg. F. W. Edwards. Paratypes: Alatae with data as for holotype.

Further material: 24 alatae, from *Nothofagus obliqua*, 35 km. W. of Angol (Malleco), Chile, 12.II.'67, leg. E. I. Schlinger no. 67-2-12a; 3 alatae, from *Nothofagus glauca* or *obliqua*, 12 km W. of Cuesta Santa Julia (Rio Negro), Argentine, 17.XII.'66, leg. E. I. Schlinger and M. E. Irwin no. 66-12-17b; 1 alata, from *Nothofagus glauca* or *obliqua*, Las Trancas (Nuble), Chile, 15.II.'67, leg. E. I. Schlinger no. 67-2-15b; 1 alata, from *Nothofagus antarctica* (?), Laguna Amarga (Magallanes), 7.XII.'66, leg. E. I. Schlinger and M. E. Irwin 66-12-7a; 10 alatae, from *Nothofagus* sp., Puerto Williams, Navarino Islands (Tierra del Fuego), Chile, Jan. 1959, leg. Kuschel BMNH no. 39/60; 11 apterous viviparous females, from *Nothofagus* not *antarctica*, 35 km S. of Estancia Camerón (Tierra del Fuego), Chile, 2.XII.'66, leg. E. I. Schlinger and M. E. Irwin 66-12-2d; 2 apterae, from *Nothofagus antarctica*?, 27 km N. of Punta Arenas (Magallanes), Chile, 27.XI.'66, leg. E. I. Schlinger no. 66-11-27a; 1 aptera, from *Nothofagus antarctica*?, Laguna Amarga (Magallanes), Chile, 7.XII.'66, leg. E. I. Schlinger no. 66-11-7a; 1 aptera, from *Nothofagus antarctica*, 37 km S. of San Carlos de Bariloche (Rio Negro), Argentine, 17.XI.'66, leg. E. I. Schlinger and M. E. Irwin, 66-11-17a; 2 apterae, from *Nothofagus* sp., Puerto Williams, Navarino Isl., Tierra del Fuego, Chile, I.'59, leg. Kuschel BMNH 39/60.

Neuquenaphis essigi spec. nov.
(Plate 19, figs. 19, 20)

?1953. Essig, E. O., Proc. Calif. Acad. Sc. (IV) 28 : 69—70, *Spicaphis michelbacheri*.

Alate viviparous female (from one specimen).

Body rather large and broad. Head and thorax blackish; abdomen with strongly transversely oval, dark intersegmental sclerites and rather marked, dark brown marginal sclerites, but no spinal or pleural sclerites. Head with 2 frontal processes of about 0.060 mm long, 2 of about 0.025 mm more caudad, and 4 small ones not higher than their basal width between the compound eyes; pronotum with 2 spinal pairs of about 0.10 mm, and a marginal pair of about 0.060 mm; mesonotum with 2 spinal pairs of about 0.080 mm; metanotum with a pair of about 0.035 mm; abdominal tergites I—IV each with a very slender, curved, almost cylindrical, spinal hair of about 0.085—0.10 mm, a small, only 0.015 mm long marginal pair, and a large, strongly tapering, very thick, submarginal pair of about 0.045 mm long, and besides these, an extremely small pleural pair; on tergites V—VII the spinal and pleural pairs all quite small, mutually not much differing in size, but the marginal pair still large though rather slender; on tergite VIII only a spinal pair as large as the marginal ones of tergites V—VII; additional small scattered processes present on tergite VI and especially on VII; all these processes are nearly smooth also at the top, and dark brown. On each process an apical, subacute, spiny hair of about 0.016—0.025 mm long, but the frontal processes each with two bluntish hairs; besides these hairs on processes, a small number of additional, smaller, dorsal hairs not on processes are present on abdominal tergites I—VII. Antennae dark brown with blackish basal segments, but the very base of segment III quite pale; just below the middle of segment III a group of strongly transverse rhinaria, slightly more than their smallest width from each other, with long (0.006 mm) cilia; hairs on segment III very numerous, about 150 per mm length of segment, acute, spiny, at angles of about 40°, and about 0.016 mm long. Last rostral segment about 0.115 mm long, with probably

4 hairs besides the 3 subapical pairs. Legs normal; fore femora swollen to twice thickness of hind femora, dark honey-brown, like all tibiae; middle and hind femora black; tibiae without spinules; first tarsal joints with two of its hairs very long, to 0.052 mm, and very stout; second tarsal joints not very spinulose; empodial hairs slightly spathulate at their tip. Wings with rather dark, normal venation; veins seemingly clear cut, but actually hardly visibly bordered (high power!). Siphunculi not darker than marginal sclerites, smooth with 5—6 transverse striae near the very large flange; subbasal hairs bluntish, not at all capitate, 0.016 mm long. Cauda dark brown; knob almost globose, as long as or just shorter than wide, only on basal half spinulose, with 27 hairs all marginally and ventrally. Rudimentary gonapophyses 3, far apart, with 2, 2, 1 hair, respectively.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Rhin. on III	Siph.	Cau.
1	2.52	2.35	0.78	0.63	0.49	0.22 + 0.33	6 & 7	0.11	0.16

(from *Nothofagus obliqua*, Cuesta la Dormida (Santiago), Chile, 1.XI.'66, leg. E.I.S. 66-11-1a).

Apterous viviparous female (from one specimen).

Body very broadly oval, at most 1½ times as long as wide, 2.40 mm long. Tergum with distinct dark brown local sclerotisation consisting at a minimum of round sclerotic plates at bases of each spinal, pleural, and marginal dorsal process, and smaller ones at bases of additional dorsal processes; at a maximum sclerotic plates more or less completely fused to dark transverse bars, first on posterior tergites. Dorsal processes arranged as follows: front with one pair of about 0.087 mm long, slightly caudad a pair of about 0.035 mm, between the compound eyes 4 of about 0.035 mm in a row; pronotum with 2 spinal pairs (0.075 mm), one pleuro-marginal pair (0.080 mm); mesonotum with 2 spinal pairs, the anterior pair nearly twice as far apart as the posterior pair (0.075 mm), and 2 marginal pairs (0.065 mm); metanotum with one spinal pair (0.075 mm), one pleural pair, one marginal pair and a small subspinal pair; abdominal tergites I—VII all with one spinal pair, one pleural pair and one marginal pair of 0.100—0.170 mm long, but between these, in the same transverse line, smaller processes of 0.050—0.110 mm long; caudad all these processes reach their maximum length; all processes pale, wrinkled, with only at the top four indistinct, bluntish spinules; dorsal hairs on top of processes very short, about 0.006 mm long, markedly knobbed, with the knob about as wide as the length of the thin shaft; a few hairs not placed on processes, cylindrical, blunt, about 0.009 mm long. Antennae very short, about ⅗ of length of body, with blackish basal segments; flagellum brownish yellow with dark apex; cilia around primary rhinaria very indistinct; processus terminalis about as long as base of segment VI; hairs on segment III very scarce, less than 30 per mm length of segment. Underside of head with 6 hairs on the frontal bulge and 4 hairs between the eyes. Rostrum nearly reaching hind coxae; last segment nearly twice as long as its basal width, 0.122 mm long, with 4 hairs besides the 3 subapical pairs. Legs not very short; all femora blackish, tibiae pale with blackish base and apex, with very few, 2—5 spinules near apex; longest hair on first tarsal joint only 0.050 mm long; empodial hairs bent near base, but apparently cylindrical,

not spathulate. Siphunculi not much darker than dorsal sclerotisation, smooth or faintly striate, with large flange; subbasal hair on a tiny process. Cauda with the knob broader than long. Rudimentary gonapophyses 3.

Measurements in mm.

No.	Length	Ant.	Ant. segments				Siph.	Cau.
	body		III	IV	V	VI		
1	2.40	1.34	0.33	0.27	0.23	0.16 + 0.16	?	0.13

(from *Nothofagus obliqua*, Cuesta la Dormida (Santiago), Chile, 1.XI.'66, leg. E.I.S. 66-11-1a).

Discussion. The alata shows clearly that there is no generic difference between this species and the type-species of *Neuquenaphis* Blanchard, and consequently *Spicaphis* Essig, 1953, type-species *Spicaphis michelbacheri* Essig, 1953, p. 69, is here considered a synonym of *Neuquenaphis* Blanchard, 1939. But because there is already a *Neuquenaphis michelbacheri* Essig, 1953, p. 66, a name I want to retain, *Neuquenaphis michelbacheri* (Essig, 1953, p. 69) (transferred from *Spicaphis* Essig) requires a new name. Because the latter species, like *Neuquenaphis essigi* spec. nov., is known from only a single apterous specimen, it is in this case equally impossible to decide whether *essigi* spec. nov. is the same species as *Spicaphis michelbacheri* Essig, or a different species. I therefore refrain from giving a new name to *Neuquenaphis michelbacheri* (Essig, 1953, p. 69), and prefer to describe *Neuquenaphis essigi* as a new species, with *Spicaphis michelbacheri* Essig as a questionable synonym. In this context also the chapter on *Neuquenaphis chilensis* Essig should be consulted.

The greater number of dorsal processes in *N. essigi* (and *N. bulbicauda*) is not a satisfactory argument even for considering *Spicaphis* a subgenus of *Neuquenaphis*. Also *N. schlingeri* would then require a new taxon.

Recognition of this species is very easy, but it resembles *N. chilensis* which Essig (1953) suspected of being the alate morph of his *Spicaphis michelbacheri* (vide p. 269).

The differences in structure between alatae and apterae in this species are so great that one might think that they are not conspecific. However, in the alata embryos are present, and in one of these one can see hairs on top of dorsal processes exactly like those found in the aptera and in the embryos inside the latter. As in *Neuquenaphis michelbacheri*, there is confusion about the identity of the host plant species.

Types. Holotype: Apterous viviparous female, from *Nothofagus obliqua*, Cuesta la Dormida (Santiago), Chile, 1.XI.'66, leg. E. I. Schlinger, no. 66-11-1a. Paratype: Alate viviparous female with data as for holotype.

Neuquenaphis flavipes spec. nov.
(Plate 16, fig. 10)

Alate viviparous female.

Body about 2.00—2.55 mm long. Head and thorax brownish black; abdomen with conspicuous intersegmental sclerites as dark as the siphunculi, and with usually less dark marginal sclerites and spinal sclerites on which the processes stand. Front, pronotum and mesonotum with spinal processes that are broader than their height (0.020 mm); ab-

domen with on the anterior 3 or 4 tergites dark, cylindrical or basally constricted spinal processes, the longest of which are about 0.060—0.080 mm; tergites IV, etc, with short processes, those on VII and VIII again longer, to 0.030 mm; on top of each a very acute hair of 0.030 mm. Antennae 1⅓—1½ times as long as body, brownish yellow, gradually darker to blackish brown towards apex with the part bearing the secondary rhinaria just darker than the part basad or apicad, nearly smooth basad the rhinaria but gradually more distinctly imbricated towards apex; segment III just below the middle with a short row of 4—9 (in two out of about 110 antennae: 3) transversely oval rhinaria with distinct cilia of about 0.0035 mm long; processus terminalis in our samples less than 0.75 mm long, 3⅓—4¼ times as long as base of segment VI. Last rostral segment rather elongated, about 0.105—0.11 mm long, at base about half its length, with usually 6 hairs besides the 3 subapical pairs. Legs yellow to yellowish brown with the knees of the fore legs quite dark; hind femora not or hardly darker than the fore femora, always much paler than the siphunculi; maximum width of fore femora about 0.115 mm, length about 0.70 mm; second tarsal joints with many spinules but tibiae with at most about 10 spinules near apex. Wings with normal venation; veins in fore wings brown, clear cut, without dark triangles at their apices. Siphunculi mostly paler than mesosternum, distinctly reticulated with about 3—4 rows of nearly isodiametric cells and 4—5 rows of strongly transverse cells, with near base a hair of about 0.025 mm. Cauda slightly paler than siphunculi, with the slender knob 1⅔—2 times as long as its maximum width.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Rhin. on III	Siph.	Cau.
1	2.23	2.96	0.84	0.63	0.55	0.16 + 0.61	6 & 8	0.11	0.21
2	2.04	3.10	0.90	0.63	0.56	0.17 + 0.67	6 & 7	0.12	0.18
3	2.15	2.97	0.84	0.63	0.55	0.17 + 0.60	8 & 9	0.13	0.21
4	2.26	2.94	0.95	0.66	0.56	0.17 + 0.60	6 & 7	0.13	0.20
5	2.31	3.17	0.94	0.72	0.57	0.16 + 0.60	6 & 7	0.13	0.22
6	2.20	3.33	0.94	0.71	0.63	0.18 + 0.68	7 & 7	0.12	0.21

(All from *Nothofagus obliqua*, Chile; 1—2, Cuesta la Dormida (Santiago), 1.XI.'66, E.I.S. 66-11-1a; 3—4, 29 km E. of Padre de las Casas (Cautin), 10.XI.'66, E.I.S. 66-11-10a; 5, 12 km W. of La Union (Valdivia), 11.XI.'66, E.I.S. 66-11-11a; 6, Los Muermos (Llanquihue), 18.I.'67, Zuniga no. 11).

Discussion. Several samples of this species are available, some quite large. All consist of alatae and sometimes also nymphs. But as several similar *Neuquenaphis* live on *Nothofagus obliqua*, the identity of the nymphs usually is not quite certain. The alatae strongly resemble those of *N. edwardsi* (Laing). But of both species samples from several provinces are available, and these differ very clearly by the pigmentation of the legs, especially the hind femora. Small differences in the length of the spinal hairs, the number of spinules on the tibiae, and the length of the processus terminalis also help to distinguish the two species.

Alatoid nymphs and nymphs without wing pads are present in several samples, notably that from Los Muermos. They show the appropriate shape of the last rostral segment, fairly well developed submarginal processes, exceedingly short (0.004—0.006 mm)

hairs on the tops of the middorsal processes, and a processus terminalis of about 0.45—0.55 mm in the larger specimens. Though the dorsal processes are brownish, their bases are paler and the integumentum around their bases is not pigmented. None of the available apterae viviparae can with certainty be associated with the alatae of *flavipes* (vide sub *N. edwardsi* Laing).

Types. Holotype: Alate viviparous female (no. 6 of measurements), from *Nothofagus obliqua,* Los Muermos (Llanquihue), Chile, 18.I.'67, leg. E. Zuniga no. 11. Paratypes: 17 alate viviparous females with data as for holotype; 42 alata viviparous females, from *Nothofagus obliqua*, Cuesta la Dormida (Santiago), Chile, 1.XI.'66, leg. E. I. Schlinger no. 66-11-1a; 4 alate females, from *Nothofagus obliqua*, 29 km E. of Padre de las Casas (Cautin), Chile, 10.XI.'66, leg. E. I. Schlinger and M. E. Irwin, no. 66-11-10a; 10 alate viviparous females, from *Nothofagus obliqua?*, 12 km W. of La Union (Valdivia), Chile, 11.XI.'66, leg. E. I. Schlinger and M. E. Irwin, no. 66-11-11a; 4 alate viviparous females, from *Nothofagus* sp., 4 km S. of Los Muermos (Llanquihue), Chile, 12.XI.'66, leg. E. I. Schlinger and M. E. Irwin no. 66-11-12b.

Additional material: 2 alate viviparous females, yellow trap, Santiago, Chile, VIII.'66, leg. Accatino no. 10.

Neuquenaphis michelbacheri Essig, 1953
(Plate 16, fig. 12)

1953. Essig, E. O., Proc. Calif. Acad. Sc. (IV) 28 : 66—67, *Neuquenaphis michelbacheri.*

Alate viviparous female.

Body about 1.70—2.25 mm long. Head and thorax blackish; abdomen pale with pale brownish intersegmental sclerites, sometimes with rather vague, paler, brownish sclerites at the bases of spinal dorsal processes and then these sclerites with a very pale centre. Processes on front and thorax not developed or just indicated; those on abd. tergites either colourless or just visibly pigmented; the spinal processes on tergites I—III cylindrical or tapering, rarely constricted at base, 2½ to 8 times as long as their half-way width, up to about 0.070 mm long, with acute hairs of 0.016—0.026 mm on top, those on the posterior tergites and the marginal ones mostly not higher than their basal width. Antennae 1⅖—1⅔ times as long as body, with dark brown or black basal segments and brownish yellow, apicad darker flagellum; segment III less than one mm long, on the middle portion over ¼ or ⅓ part of their length with 9—15 strongly transversely oval rhinaria with a distinct, complete, fringe of hairs of less than 0.003 mm long; processus terminalis less than one mm long, 4½—5½ times as long as base of segment VI; flagellum past the rhinaria gradually more distinctly imbricated. Rostrum about reaching to the middle coxae; last segment 0.087—0.098 mm long, about 1¾ times its basal width, with 4—6 hairs besides the 3 subapical pairs. Legs brownish yellow to yellowish brown, with dark knees to the fore legs; hind femora sometimes darker brown than the fore femora; apices of hind tibiae with very few, 1—9, spinules between the hairs. Fore wings with quite dark, seemingly clear cut veins, but basal vein with a vague brownish border, and all the veins with inconspicuous but distinct dark triangles at their tips. Siphunculi not black, but dusky brown, about like the coxae, with 5—6 rows of isodiametric reticulation and 1—2 rows of rather incomplete, strongly transverse, reticulation. Cauda paler than siphunculi, the rather small knob 1½—2 times as long as its maximum width.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Rhin. on III	Siph.	Cau.
1	1.73	2.79	0.75	0.57	0.49	0.13 + 0.70	9 & 11	0.09	0.14
2	2.01	2.85	0.80	0.54	0.48	0.14 + 0.73	10 & 10	0.11	0.17
3	2.00	2.93	0.78	0.60	0.50	0.15 + 0.72	9 & 10	0.12	0.20
4	2.22	3.30	0.91	0.65	0.56	0.16 + 0.83	13 & 13	0.14	0.20
5	2.01	3.20	0.93	0.64	0.53	0.16 + 0.77	15 & 15	0.14	0.19
6	1.95	3.02	0.86	0.62	0.55	0.15 + 0.69	10 & 10	0.12	0.18
7	1.85	2.96	0.83	0.56	0.49	0.15 + 0.76	8 & 10	0.12	0.18
8	1.72	2.78	0.68	0.55	0.51	0.14 + 0.73	9 & 10	0.11	0.18

(1—2, paratypes, from *Nothofagus dombeyi*, Temuco (Cautin), Chile, 28.I.'51, leg. A. E. Michelbacher; 3—5, from *Nothofagus obliqua*, 20 km E. of Padre de las Casas (Cautin), 10.XI.'66, leg. E.I.S. 66-11-10a; 6, from *Nothofagus obliqua*, Cuesta la Dormida (Santiago), Chile, 1.XI.'66, leg. E.I.S. 66-11-1a; 7, from *Nothofagus obliqua*, 8 km W. of Angol (Malleco), Chile, 10.II.'66, leg. E.I.S. 67-2-10b; 8, from *Nothofagus dombeyi*, 8 km W. of La Picada, El Refugio, Volcan Osorno (Osorno), Chile, 6.II.'67, leg. E.I.S. 67-2-6c).

Discussion. Dr. Schlinger collected several samples that agree completely with the paratypes of *Neuquenaphis michelbacheri* Essig. At first sight the specimens look like *N. edwardsi*, to which it is closely related. But it differs by the pale spinal processes which are not or rarely placed on pigmented sclerotic plates. That might suggest more or less teneral specimens, or too long treatment with KOH. However, the dark wing veins and the triangles at the ends of the veins of the fore wings suggest more pigmentation, and it is the combination of the pale dorsal processes, the dark triangles and the higher average number of secondary rhinaria that have convinced me that two species are involved. Essig mentions 8—16 rhinaria, in his specimens, we found 8—15 in ours.

E. O. Essig gave the host plant as *Nothofagus dombeyi*, just as in *Neuquenaphis essigi* spec. nov., but Dr. Schlinger collected both species off *Nothofagus obliqua*, and only one *michelbacheri* from *Nothofagus dombeyi*. Most probably some mistake has been made in the identification of the host plant.

Apterae are not known. I do not exclude the possibility that they are among the apterous material listed in this paper under *Neuquenaphis edwardsi* Laing.

Types. Holotype: Alate viviparous female, from *Nothofagus dombeyi*, near Temuco (Cautin), Chile, 28.I.'51, leg. A. E. Michelbacher. Paratypes: 12 alate viviparous females with data as for holotype.

Further material: 1 alata, from *Nothofagus obliqua*, Cuesta la Dormida (Santiago), Chile, 1.XI.'66, leg. E. I. Schlinger, no. 66-11-1a; 1 alata, from *Nothofagus obliqua*?, 19.6 km W. of Angol (Malleco), Chile, 9.XI.'66, leg. E. I. Schlinger and M. E. Irwin, no. 66-11-9a; 5 alatae, from *Nothofagus obliqua*, 29 km E. of Padre de las Casas (Cautin), 10.XI.'66, leg. E. I. Schlinger and M. E. Irwin, no. 66-11-10a; 1 alata, from *Nothofagus dombeyi*, 8 km W. of la Picada, El Refugio (Osorno), 6.II.1967, leg. E. I. Schlinger, no. 67-2-6c; 3 alatae, from *Nothofagus obliqua*, 18 km W. of Angol (Malleco), 10.II.'67, leg. E. I. Schlinger, no. 67-2-10b.

Neuquenaphis palliceps spec. nov.
(Plate 14, fig. 4; Plate 16, fig. 9)

Alate viviparous female.

Body rather large, about 2.25—2.90 mm long. Head brownish yellow, usually pale, always with very conspicuous blackish brown rings around the ocelli; pronotum about as dark as head; mesothorax darker but never blackish; abdomen either quite unpigmented, or with some small and inconspicuous, brownish, intersegmental sclerites. Front, pronotum, and mesonotum with very short (0.020 mm) darkish processes; abdomen on tergites I—III with very slender, almost cylindrical, quite colourless, up to about 0.10 mm long, spinal processes; the other tergites with conical, usually faintly brownish spinal processes of about 0.020—0.040 mm long; marginally on tergites II—V on each side mostly two short (0.015 mm) conical processes, though several may be undeveloped; on top of each dorsal process a long, fine and straight hair of 0.035—0.045 mm long. Antennae very long, 1⅔—2 times as long as body, pale, with the flagellum gradually darker towards apex; segment III at about $^4/_9$ of its length with 1—6 transversely oval rhinaria side by side; 2 and 5 rhinaria may occur on the same specimen; these rhinaria indistinctly ciliate, and parts of the rim apparently without hairs; processus terminalis more than one mm long, 5½—7¼ times as long as basal part of segment VI. Rostrum very short; last segment short, only 0.080—0.090 mm long, blunt, about 1—1¼ times as long as its basal width, with 4—6 hairs besides the 3 subapical pairs. Legs long, pale brownish yellow, but the knees of the fore legs blackish brown; hind tibiae apparently without spinules on apical part; second tarsal joints with few distinct spinules on the imbrications. Wings with normal, rather dark venation, the basal vein just visibly bordered with very pale brown. Siphunculi dark, possibly sometimes blackish, darker than the mesosternum, with 5—7 basad less distinct rows of nearly isodiametric reticulation and some very indistinct transverse reticulation. Cauda pale, the knob rather tapering, about 1⅔—$1^7/_9$ times as long as its greatest width.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Rhin. on III	Siph.	Cau.
1	2.94	4.83	1.32	1.04	0.94	0.19 + 1.09	4 & 5	0.16	0.22
2	2.78	4.99	1.29	1.09	1.02	0.21 + 1.15	3 & 4	0.21	0.24
3	2.49	4.67	1.21	0.96	0.92	0.16 + 1.21	3 & 4	0.15	0.21
4	2.57	4.68	1.31	0.99	0.95	0.16 + 1.09	3 & 3	0.14	0.22
5	2.49	5.01	1.35	1.04	0.97	0.20 + 1.23	3 & 3	0.15	0.19
6	2.50	4.76	1.30	0.89	0.89	0.18 + 1.15	2 & 3	0.17	0.21

(All from *Nothofagus dombeyi*; 1—2, 4 km SW. of Villarica (Cautin), Chile, 18.XII.'66, leg. E.I.S. 66-12-18a; 3, Las Trancas (Nuble), Chile, 28.I.'67, leg. E.I.S. 67-1-28e; 4, 35 km W. of Angol (Malleco), Chile, 12.II.'67, leg. E.I.S. 67-2-12b; 5, 18 km W. of Angol (Malleco), Chile, 10.II.'67, leg. E.I.S. 67-2-10d; 6, 8 km E. of Pucon (Cautin), Chile, 9.II.'67, leg. E.I.S. 67-2-9c).

Apterous viviparous female.

Body rather large, about 2.25—2.70 mm long, rather broadly pyriform. Tergum with more or less distinct, brownish, local sclerotisation; head pale to pale brownish; thoracic

nota and abd. tergites with colourless to brown spinal, pleural and marginal sclerites on each of which a dorsal process stands. Dorsal processes rather long and straight, slender, 10—12 times as long as their half-way width, the spinal ones on abd. tergite III about 0.17—0.22 mm long; submarginal processes on abdomen absent, or inconspicuous and not longer than their half-way width; processes light brown to brown with paler bases, moderately scabrous, with very small apical spinules. Hair on top of the processes tapering, 0.008—0.012 mm long, with the apex bluntish, not incrassate. Antennae pale yellowish, gradually darker towards the light brown apex, very long, 1⅖—1⅔ times as long as body; processus terminalis 4¾—5½ times as long as basal part of segment VI. Rostrum not reaching the middle coxae; last segment about 0.080—0.085 mm long, blunt, not or hardly longer than its basal width, with 3—5 hairs besides the 3 subapical pairs. Siphunculi stout, pigmented like the sclerites, i.e., from very pale with just darker apex, to brown, near apex with 2—4 rows of slightly transverse reticulations which basad become very indistinct. Cauda also in pigmented specimens pale, with the oval knob about 1½—1$^{9}/_{10}$ times as long as its greatest width.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Siph.	Cau.
1	2.68	3.58	1.00	0.68	0.62	0.16 + 0.87	0.21	0.28
2	2.36	3.66	1.00	0.70	0.64	0.17 + 0.88	0.17	0.27
3	2.29	3.66	0.94	0.76	0.66	0.18 + 0.89	0.20	0.27
4	2.49	3.53	0.96	0.69	0.67	0.18 + (0.81 +)	0.15	0.29

(1, from *Nothofagus dombeyi,* Petrohué (Osorno), Chile, 15.XI-'66, leg. E.I.S. 66-11-15a; 2—3, from *Nothofagus dombeyi,* 11.4 km E. of Llao Llao (Rio Negro), Argentine, 16.XI.'66, leg. E.I.S. 66-11-16a; 4, from *Nothofagus* sp., Puerto Eden, Wellington Island (Magallanes), Chile, 13.XII.'58, leg. Kuschel, BMNH no. 41/60).

Fundatrix.

Very much like preceding morph, but body slightly broader. Dorsum in the available specimens perhaps sclerotised but not pigmented. Dorsal processes slightly thicker and shorter. Submarginal processes on abd. segments I—IV very well developed, ½—¾ times of the length of the nearest marginal processes. Antennae about 1⅕—1⅖ times length of body; processus terminalis 3½—4½ times as long as basal part of segment VI. Siphunculi brownish yellow, with 2—3 rows of strongly transverse reticulation near the flange, remainder smooth. Cauda with the knob 1⅓—1⅖ times as long as its greatest width. Other characters about as in the preceding morph.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Siph.	Cau.
1	2.57	2.88	0.73	0.53	0.52	0.18 + 0.68	0.19	0.26
2	2.87	3.47	0.97	0.69	0.62	0.20 + 0.75	0.21	0.28
3	1.92	2.78	0.75	0.54	0.51	0.14 + 0.65	0.18	0.21
4	2.19	2.92	0.76	0.58	0.55	0.16 + 0.64	0.17	0.23
5	2.42	2.92	0.81	0.55	0.54	0.17 + 0.61	0.15	0.28
6	2.45	2.76	0.69	0.55	0.52	0.16 + 0.61	0.17	?

(1—2, from *Nothofagus dombeyi*, Petrohué (Osorno), Chile, 15.I.'66, leg. E.I.S. 66-11-15a; 3—4, from *Nothofagus dombeyi*, 11.4 km E. of Llao Llao (Rio Negro), Argentine, 16.XI.'66, leg. E.I.S. 66-11-16a; 5—6, from *Nothofagus* sp., Puerto Eden, Wellington Island (Magallanes), Chile, 13.XII.'58, leg. Kuschel, BMNH no. 41/60).

Discussion. Enough alatae from different collections are available for a good insight into the variability of that morph. Various nearly full grown alatoid nymphs with visible secondary rhinaria can with certainty be identified as belonging to the same species as the alatae with which they occurred in the samples.

Unfortunately apterae were in no case present in the same sample with alatae and therefore doubt about their identity persists. Another difficulty is that in most samples with apterae, there are two quite different kinds that because of the shape of their last rostral segment can only be *Neuquenaphis palliceps* spec. nov., unless there exists another species with an extremely blunt last rostral segment of which no alatae were collected. In one kind there are quite long submarginal processes, and therefore 8 dorsal processes on each of abdominal segments I—V, in the other kind submarginal processes are absent or minute, and only 6 dorsal processes on each of the mentioned abdominal segments are present. Such a reduction of the number of dorsal processes was also observed in the oviparae of *Neuquenaphis bulbicauda* spec. nov., in comparison with the apterae viviparae of that species.

Because the body and the cauda in specimens with submarginal dorsal processes tend to be broader, and the processus terminalis slightly shorter, I have tentatively described them as fundatrices of *Neuquenaphis palliceps* spec. nov. It is not significant that moderately to well developed submarginal processes occur in the mentioned alatoid nymphs, for in species in which the apterae have no trace of submarginal processes the alatoid nymphs always have them.

Types. All from *Nothofagus dombeyi*. Holotype: Alate viviparous female (no. 1 of measurements), 2 km SW. of Villarica (Cautin), Chile, 18.XII.'66, leg. E. I. Schlinger no. 66-12-18a. Paratypes: 41 alatae with collecting data as for holotype; 9 alatae, Las Trancas (Nuble), Chile, 28.II.'67, leg. E. I. Schlinger no. 67-1-28e; 3 alatae, 35 km W. of Angol (Malleco), Chile, 12.II.'67, leg. E. I. Schlinger no. 67-2-12b; 17 alatae, 8 km E. of Pucon (Cautin), Chile, 9.II.'67, leg. E. I. Schlinger no. 67-2-9c; 18 alatae, 18 km W. of Angol (Malleco), Chile, 10.II.'67, leg. E. I. Schlinger no. 67-2-10d; 1 alata, Las Trancas (Nuble), Chile, 15.II.'67, leg. E. I. Schlinger no. 67-2-15a; 5 fundatrices(?) and 1 aptera vivipara, Petrohué (Osorno), Chile, 15.XI.'66, leg. E. I. Schlinger and M. E. Irwin no. 66-11-15a; 3 fundatrices and 9 apterae viviparae, 11.4 km E. of Llao Llao (Rio Negro), Argentine, 16.XI.'66, leg. E. I. Schlinger and M. E. Irwin no. 66-11-16a.

Further material: 2 fundatrices(?) from *Nothofagus* sp., Puerto Eden, Wellington Island (Magallanes), Chile, 13.XII.'58, leg. Kuschel, BMNH no. 41/60; 1 aptera vivipara, host, locality and collector like preceding, but 4.XII.'58, BMNH no. 40/60; 2 alate viviparous females, no host, date or locality, leg. Roy. Soc. Exp. to S. Chile, 1958—59, HW 17 T 128, and some nymphs with similar data.

Neuquenaphis schlingeri spec. nov.
(Plate 14, fig. 2; Plate 17, fig. 14)

Alate viviparous female.

Body about 1.40—1.70 mm long. Head very pale brown with blackish brown rings around the ocelli; thorax brown to dark brown; abdomen without any pigmentation. Dorsal processes either completely absent, or only very small and low ones on front and on abd. tergite VIII. Spinal hairs somewhat spiny, 0.011—0.021 mm long, only on abd. tergites VII and VIII sometimes on raised bases. Antennae pale yellow with dark brown apices, thin, 1⅓—1½ times as long as body; segment I with a low blunt process at inner apex; segment III with 1—3 round or broadly oval rhinaria at about ⅓ from base, rather far apart; cilia present but very indistinct; processus terminalis much longer than segment III, 4¾—5½ times base of segment VI. Rostrum hardly reaching middle coxae; last segment 0.060 mm long, hardly longer than its basal width, with 2—4 hairs besides the 3 subapical pairs. Legs slender, pallid with the much incrassate fore femora brownish yellow with blackish brown dorso-apical part; hind tibiae with rather numerous, perhaps 40 or 50, spinules on distal portion. Wings with normal, thin, rather dark brown veins, the fore wings with very dispersed scales over nearly their whole surface. Siphunculi very broadly conical, low, dark to probably black, without isodiametric cells, only with some rows of very strongly transverse cells on and just below the indistinct flange; submedial hair acute, 0.013—0.015 mm long. Cauda pale; the shortly acorn-shaped knob only 1⅓ times as long as its largest width.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Rhin. on III	Siph.	Cau.
1	1.40	1.84	0.41	0.31	0.28	0.11 + 0.61	1 & 2	0.06	0.17
2	1.83	2.67	0.57	0.45	0.52	0.15 + 0.83	2 & 2	0.06	0.16
3	1.67	2.55	0.57	0.41	0.45	0.17 + 0.80	2 & 3	0.07	0.15

(1—2, from *Nothofagus obliqua*, 18 km W. of Angol (Malleco), Chile, 10.II.'67, leg. E.I.S. 67-2-10b; 3, like no. 1 but E.I.S. 67-2-10g).

Apterous viviparous female.

Body rather pyriform, about 1.60—1.80 mm long. Tergum completely colourless, not visibly sclerotized. Dorsal processes pale, rather slender, to 10 times as long as their halfway width, slightly curved, slightly spinulose. Head only with 2 long (0.15 mm), frontal processes; pronotum without processes; from mesothorax to abd. segment IV each segment with 2 long marginal processes, 2 submarginal processes ⅓—½ of the length of the marginal ones, and 2 very short, often completely absent, spinal processes of at most 0.040 mm long; tergite VI with long marginal processes, and submarginal processes of 0.040—0.080 mm; tergite VII with 2 long spinal processes and 2 long marginal processes; tergite VIII only with 2 moderately long (0.050—0.080) spinal processes; pleural processes absent. Hairs on top of the processes about 0.012—0.014 mm long, cylindrical, quite blunt or with slightly incrassate apex. Antennae pale with blackish brown apices, 1⅕—1⅔ times as long as body; segment V as long as, or longer than segment III; processus terminalis 5—6 times as long as basal part of segment VI, to twice as long as

segment III. Rostrum short, only just reaching to the middle coxae; last segment very short, to 0.070 mm long, hardly or not longer than its basal width, with 2—4 hairs besides the 3 subapical pairs. Legs pale; hind tibiae slightly incrassate on basal ⅓ part and there with 5—30 rather flat pseudosensoria; on distal half an unusually large number of spinules, some 50—70 in number. Siphunculi rather low conical, dusky on distal half or above, ornamented as in alatae or more extensively so. Cauda pale, the thick knob shortly acorn-shaped, only 1¼—1⅓ times as long as its largest width.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Siph.	Cau.
1	1.79	2.30	0.37	0.34	0.41	0.15 + 0.88	0.07	0.13
2	1.76	2.30	0.43	0.37	0.40	0.14 + 0.79	0.07	0.17
3	1.67	2.34	0.38	0.35	0.39	0.14 + 0.81	0.08	0.16
4	1.66	2.16	0.38	0.34	0.40	0.13 + 0.75	0.09	0.16
5	1.66	2.32	0.42	0.33	0.43	0.15 + 0.83	0.07	0.13
6	1.62	2.04	0.36	0.30	0.36	0.12 + 0.68	0.07	0.17
7	1.64	1.96	0.36	0.29	0.36	0.13 + 0.67	0.09	0.16
8	1.66	?	0.26	0.24	0.33	0.12 + ?	0.09	0.16

(All from *Nothofagus obliqua*; 1—4, 15 km E. of Curanipe (Maule), Chile, 24.I.'67, leg. E.I.S. 67-1-24a; 5—7, 18 km W. of Angol (Malleco), Chile, 10.II.'67, leg. E.I.S. 67-2-10c; 8, 20 km E. of Padre de las Casas (Cautin), Chile, 10.XI.'66, leg. E.I.S. 66-11-10a).

Discussion. The species can very easily be recognized by the distribution of dorsal processes in apterae viviparae, the virtual absence of such processes in alatae, the long processus terminalis, short last rostral segment, etc.

In seven of the apterae described the hind tibiae have pseudosensoria as in oviparae, but they contain many embryos and no eggs. In specimen no. 8 the antennal segments are very much shorter than in the others, the tibiae have short, faintly capitate hairs on the dorsal surface on basal half, and the hind tibiae have no pseudosensoria. This might be a fundatrix.

The pattern of the dorsal processes in embryos seems to be essentially like that of older larvae; only the marginal processes are elongate, the others obsolete; the hairs on top of the processes are very short, at most 0.005 mm long, but very distinctly knobbed.

Types. Holotype: Apterous viviparous female (no. 1 of measurements), from *Nothofagus obliqua*, 15 km E. of Curanipe (Maule), Chile, 24.I.'67, leg. E. I. Schlinger no. 67-1-24a. Paratypes: 3 apterae viviparae, with data as for holotype; 6 apterae viviparae and 3 alatae, from *Nothofagus obliqua*, 18 km W. of Angol (Malleco), Chile, 10.II.'67, leg. E. I. Schlinger no. 67-2-10g and 67-2-10b; 1 aptera vivipara (fundatrix?), from *Nothofagus obliqua*, 20 km E. of Padre de las Casas (Cautin), Chile, 10.XI.'66, leg. E. I. Schlinger and M. E. Irwin no. 66-11-10a.

Neuquenaphis sensoriata spec. nov.
(Plate 14, fig. 1; Plate 16, fig. 11)

Alate viviparous female.

Body about 1.70—2.05 mm long. Head and thorax black or blackish; abdomen with small pale to dark brown intersegmental sclerites and with or without very small and

inconspicuous pale brownish sclerites at the bases of spinal hairs or processes. Processes on head and thorax absent or reduced to low hills; those on abdominal tergite I—III to about 0.080 mm long but mostly much shorter, usually slender and up to 10 times as long as their half-way width, not or rarely constricted near base, usually slightly pigmented and then nearly always paler at apex than at base, with on top a hair of up to 0.022 mm with a rarely quite blunt, usually very nearly acute apex; processes on more posterior tergites small or undeveloped while those on tergite VIII are hardly larger than those on tergites VI or V. Antennae $1^1/_{10}$—$1^2/_5$ times as long as body; basal segments dark to blackish, flagellum with the part basad the secondary rhinaria pale, the rest brownish to dark brown; segment III with 12—30 rhinaria, in an uneven, partly double, row starting at basal $^1/_3$—$^2/_5$ part and ending at $^3/_4$—$^9/_{10}$ of the length of the segment; cilia around the rhinaria rarely up to 0.0035 mm, normally shorter; processus terminalis short, only 2—$3^1/_6$ times as long as base of segment VI. Rostrum just reaching middle coxae; apical segment rather long, 0.10—0.11 mm, with rather straight sides, twice as long as its basal width, with 7—12 hairs besides the 3 subapical pairs. Legs brownish yellow with blackish knees to the fore femora, distinct darker apices to the tibiae; hind femora much darker than fore femora, up to almost black; apices of hind tibiae with very few, perhaps 3—8, spinules. Wings with normal venation; veins dark, under high power with a very vague brownish border, and with hardly noticeable dusky triangles at their tips. Siphunculi dark to blackish, with 3—4 rows of isodiametric cells and 3—4 rows of strongly transverse reticulation. Cauda slightly paler than the siphunculi, the knob consisting of a thick globular part with a slightly thinner cylindrical, apically rounded part on top, therefore only $1^1/_2$—$1^3/_4$ times as long as its largest width.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Rhin. on III	Siph.	Cau.
1	1.89	2.16	0.73	0.38	0.33	0.13 + 0.41	17 & 20	0.11	0.18
2	1.97	2.25	0.73	0.41	0.39	0.13 + 0.40	23 & 25	0.12	0.16
3	1.88	2.19	0.73	0.40	0.39	0.13 + 0.40	20 & 22	0.12	0.17
4	1.78	2.20	0.72	0.44	0.36	0.13 + 0.38	19 & 23	0.12	0.17
5	1.86	2.17	0.66	0.46	0.33	0.14 + 0.33	14 & 16	0.10	0.16
6	1.89	2.29	0.76	0.49	0.30	0.15 + 0.30	16 & 17	0.09	0.15
7	1.95	2.22	0.70	0.43	0.36	0.15 + 0.38	15 & 17	0.11	0.18
8	1.86	2.35	0.76	0.46	0.39	0.15 + 0.43	12 & 14	0.12	0.15

(1—4, from *Nothofagus obliqua*?, 19.6 km W. of Angol (Malleco), Chile, 9.XI.'66, leg. E.I.S. 66-11-9a; 5—7, from *Nothofagus obliqua*, Cuesta la Dormida (Santiago), Chile, 11.XI.'66, leg. E.I.S. 66-11-1a; 8, from *Nothofagus obliqua*, 18 km W. of Angol (Malleco), Chile, 10.II.'67, leg. E.I.S. 67-2-10b).

Apterous viviparous female.

Body broadly oval, about 1.90—2.10 mm long. Head and pronotum rather dark brown sclerotic, meso- and metanotum and all abdominal tergites with corrugated, brown, spinopleural sclerotic transverse bars on which the spinal and pleural processes stand. Submarginal processes absent. Dorsal processes long, on tergite VII 0.25—0.32 mm long, mostly slightly curved, rather stout, e.g., those on tergite III 5—7 times as long as their half-way width, pale with the very base and the apical half dark to brown; distal third

unusually smooth, and the 4—5 apical spinules blunt to semiglobular, the hairs on top of mid-dorsal processes exceedingly short, 0.004 mm long or shorter, mostly not extending past the apical "spinules", with rather globular, thin tips. Antennae just over half as long as body, brown with basal part of segment III pale; processus terminalis 1½—2 times as long as base of segment VI. Rostrum reaching past middle coxae; last segment 0.11—0.125 mm long, with 8—11 hairs besides the 3 subapical pairs. Siphunculi blackish brown with the very base partly pale, nearly smooth with some rows of transverse reticulation on or just below the wide flange. Cauda brown with the knob consisting of a globular and a blunt conical part or acorn-shaped, 1½ times as long as its largest width.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Siph.	Cau.
1	2.02	1.11	0.32	0.13	0.18	0.11 + 0.21	0.11	0.23
2	2.07	1.17	0.32	0.17	0.21	0.13 + 0.19	0.11	0.22
3	1.94	1.03	0.29	0.14	0.17	0.11 + 0.18	0.11	0.21

(1—2, from *Nothofagus obliqua?*, 19.6 km W. of Angol (Malleco), Chile, 9.XI.'66, leg. E.I.S. 66-11-9a; 3, from *Nothofagus obliqua*, Cuesta la Dormida (Santiago), Chile, 11-XI.'66, leg. E.I.S. 66-11-1a).

Discussion. Most alatae of this species can easily be recognized by the high number of rhinaria on antennal segments III; when there is an overlap with other species, the short processus terminalis and the number of hairs on the last rostral segments may help. It is likely that specimens with less than twelve secondary rhinaria occur because sample E.I.S. 66-11-1a consists of only 13 specimens with 12—19 rhinaria. In sample E.I.S. 66-11-9a the following numbers occur: 14 (1 x), 15 (1 x), 17 (4 x), 18 (2 x), 19 (5 x), 20 (13 x), 21 (9 x), 22 (7 x), 23 (14 x), 24 (12 x), 25 (3 x), 26 (1 x), 27 (1 x), and 30 (1 x).

The apterae almost certainly belong to the same species as the alatae with which they were collected. For they also show a rather long last rostral segment with a high number of hairs, a short processus terminalis, etc.

First instar larvae have a last rostral segment of 0.096 mm, marginal dorsal processes of up to 0.11 mm, while the spinules on top of these processes are semiglobular. Alatoid nymphs with a discernible high number of secondary rhinaria have normal, sharply spinulose, dorsal processes, including short submarginal ones, on abdominal tergites I—IV.

Types. Holotype: Alate viviparous female (no. 1 of measurements), from *Nothofagus obliqua?*, 19.6 km W. of Angol (Malleco), Chile, 9.XI.'66, leg. E. I. Schlinger no. 66-11-9a. Paratypes: 36 alatae and 4 apterous viviparous females with data as for holotype; 13 alatae and 3 apterae, from *Nothofagus obliqua*, Cuesta la Dormida (Santiago), Chile, 1.XI.'66, leg. E. I. Schlinger no. 66-11-1a.

Additional material: 1 alata, from *Nothofagus obliqua*, 18 km W. of Angol (Malleco), Chile, 10.II.'67, leg. E. I. Schlinger no. 67-2-10b.

Neuquenaphis similis spec. nov.
(Plate 14, fig. 3)

Apterous viviparous female.

Body about 2.65—2.80 mm long, elongated pyriform. Head pale brownish; thorax and abdomen pale, to faintly brownish around the bases of the dorsal processes. The latter arranged as usual, but erratically short submarginal processes present, 1—2 per body and mostly on abd. tergites IV and III; spinal processes on abd. tergite II—III about 0.13—0.17 mm long, and about 7—8 times as long as their half-way width, brown with paler bases, with rather faintly imbricated distal part. Hairs on top of dorsal processes stout, with a rather cylindrical shaft and swollen, indistinctly longitudinally striate apex, about 0.013—0.022 mm long. Antennae about 1⅖—1½ times as long as body, with brown basal segments; flagellum brownish yellow with dark brown apex; processus terminalis 4—4½ times as long as basal part of segment VI; hairs on ant. segment III rather long, 0.016 mm, stiff, just blunt, numerous so that about 80—90 hairs per mm length of flagellum occur. Rostrum just reaching hind coxae; last segment about 0.13—0.14 mm long, with 4—6 hairs besides the 3 subapical pairs. Legs long, especially the tibiae, yellowish brown with darker femora; second tarsal joints distinctly but very superficially imbricated, with very few, perhaps 5—8 spinules ventrally. Siphunculi pigmented like the femora, smooth, with only on the large flange 2—3 rows of coalescing striae or strongly transverse reticulation. Cauda paler than siphunculi, the rather thick, very blunt knob about 1½ times as long as its greatest width.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Siph.	Cau.
1	2.68	3.87	0.96	0.89	0.75	0.18 + 0.85	0.19	0.30
2	2.75	4.09	1.00	0.89	0.81	0.21 + 0.87	0.16	0.29
3	2.77	4.01	1.02	0.89	0.76	0.21 + 0.83	0.20	0.31

(1—3, from *Nothofagus obliqua*, 20 km E. of Caramavida (Arauco), Chile, 31.I.'67, leg. E.I.S. 67-1-31b).

Discussion. Of a few *Neuquenaphis* species, including some known from *Nothofagus obliqua*, only alatae are known. Therefore it seems possible that the apterae described here as *Neuquenaphis similis* might belong to *N. sensoriata, N. flavipes* or *N. michelbacheri*. But the processus terminalis in alate *N. sensoriata* and *N. flavipes* is too short. The embryos in *N. similis* are quite characteristic, with capitate dorsal hairs of about 0.009 mm long, and they have faintly capitate hairs on the femora. In *N. sensoriata, N. flavipes*, and also in *N. michelbacheri* the embryos have dorsal hairs of 0.002—0.004 mm, and the femora have acute hairs. Apparently there must be still another kind of alatae on *Nothofagus obliqua*, of which by analogy one can predict that it has the antennae at least 1½ times as long as body, probably quite long dorsal hairs, and embryos with dorsal hairs of at least 0.009 mm long.

Types: Holotype: Apterous viviparous female (no. 1 of measurements), from *Nothofagus obliqua*, Caramavida (Arauco), 31.I.1967, leg. E. I. Schlinger no. 67-1-31b. Paratypes: 5 apterae with collecting data as for holotype.

TYPES

In British Museum (Natural History), London: holotype and paratypes of *Myzocallis edwardsi* Laing, paratypes of *Neuquenaphis bulbicauda* spec. nov., *N. flavipes* spec. nov., and *N. sensoriata* spec. nov. In Science Museum of California Academy of Sciences, San Francisco: holotype of *Neuquenaphis chilensis* Essig, holotype and paratypes of *N. michelbacheri* Essig, holotype of *Spicaphis michelbacheri* Essig. In Essig collection in Entomology Division, University of California, Berkeley: paratypes of *Neuquenaphis chilensis* Essig and *N. michelbacheri* Essig. In Agricultural Experimental Station, La Rinconada near Maipu, Chile: holotypes of *Neuquenaphis bulbicauda* spec. nov., *N. palliceps* spec. nov., *N. schlingeri* spec. nov., *N. sensoriata* spec. nov., *N. similis* spec. nov., as well as paratypes of most of these species and of *N. flavipes* spec. nov. In Department of Entomology, University of California, Riverside: paratypes of the mentioned new species excepting *N. essigi* spec. nov. In the author's collection: holotypes of *N. essigi* spec. nov., and *N. flavipes* spec. nov., and paratypes of all the new species, of *Myzocallis edwardsi* Laing, and of *Neuquenaphis michelbacheri* Essig.

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I am very much obliged to Dr. Evert I. Schlinger, Riverside, California, for letting me study the excellently preserved and very rich material of *Neuquenaphis* that he collected; to Dr. Paul H. Arnaud of the California Academy of Sciences, San Francisco, for the lion for the type of *Neuquenaphis chilensis* Essig; to Dr. J. P. Doncaster and Dr. V. F. Eastop of the British Museum (Natural History), London, for the loan of material, including some paratypes of *Neuquenaphis edwardsi* (Laing); to Dr. E. Zuniga, La Cruz, Chile, for material of *N. flavipes*; to Dr. Robert C. Dickson, Riverside, California for presorting the aphids collected by Dr. Schlinger; and to Mr. C. A. Koedam, of the Institute for Phytopathological Research, Wageningen, for making the photographs in this paper.

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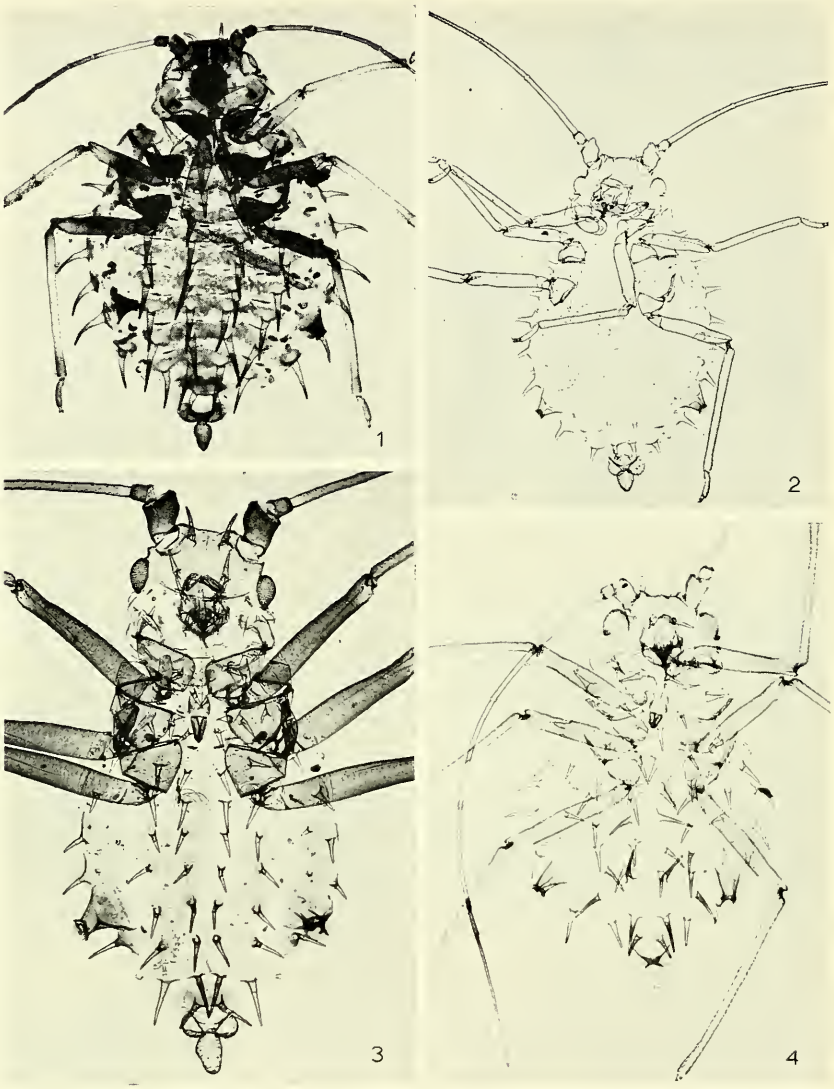

Fig. 1. *N. sensoriata* spec. nov., apterous viviparous female, × 26.5. Fig. 2. *N. schlingeri* spec. nov., apterous viviparous female, × 22. Fig. 3. *N. similis* spec. nov., apterous viviparous female, × 26 Fig. 4. *N. palliceps* spec. nov., apterous viviparous female, × 22

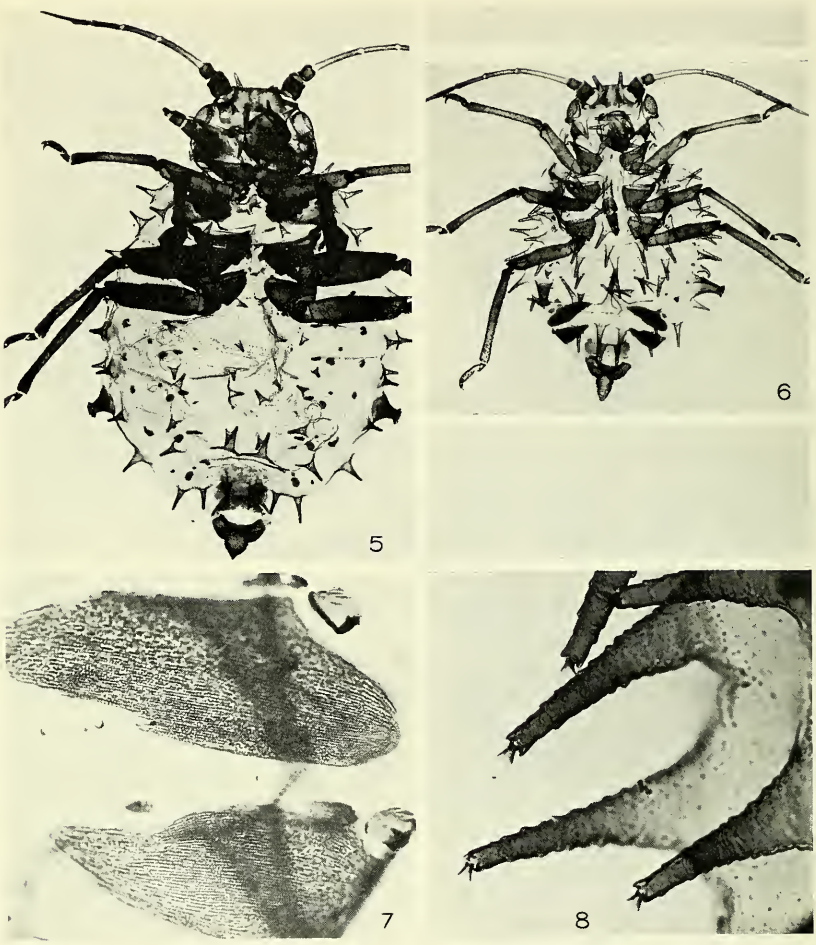

Fig. 5—8. *N. bulbicauda* spec. nov. 5. apterous viviparous female, × 26.5. 6. ovipara, × 26.5. 7. ovipara, sclerotic zones on sternites VI and VII, × 227. 8. ovipara, marginal processes with hairs between left mid and hind femora, × 227

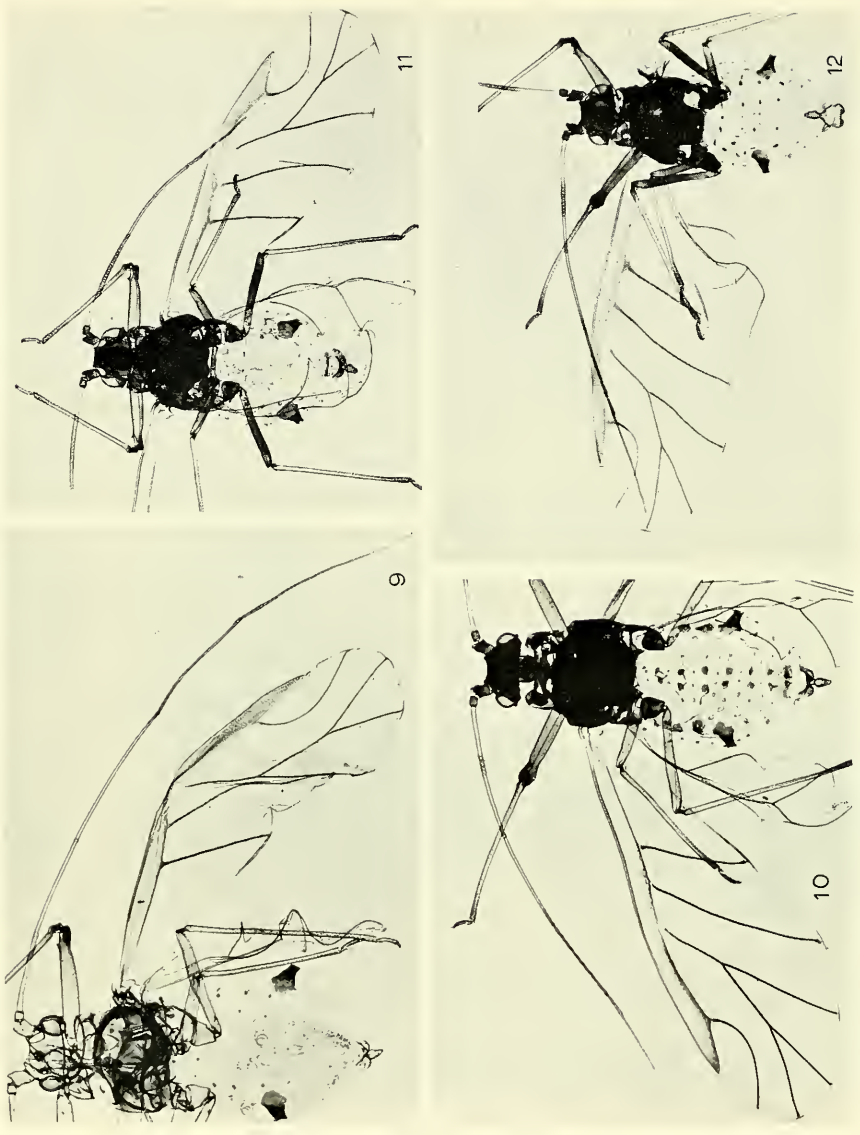

Fig. 9. *N. pallicepS* spec. nov., alate female, × 16. Fig. 10. *N. flaripes* spec. nov., alate female, × 20. Fig. 11. *N. sensoriata* spec. nov., alate female, × 18,5. Fig. 12. *N. nicbelbacheri* Essig, alate female, × 18

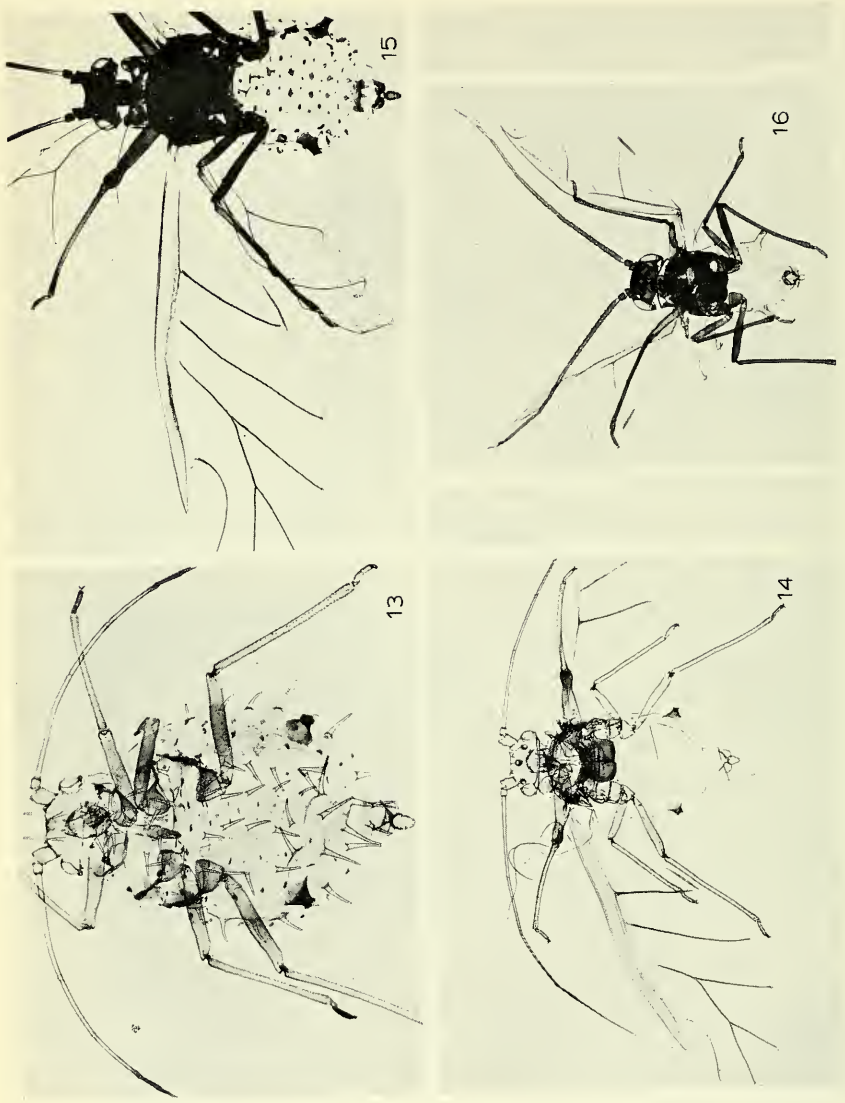

Fig. 13. *N. edwardsi* (Laing), apterous viviparous female (no. 6 of measurements), × 23.5.
Fig. 14. *N. schlingeri* spec. nov., alate female, × 14.5. Fig. 15. *N. edwardsi* (Laing), alate female (no. 5 of measurements), × 19. Fig. 16. *N. bulbicauda* spec. nov., alate male, × 18

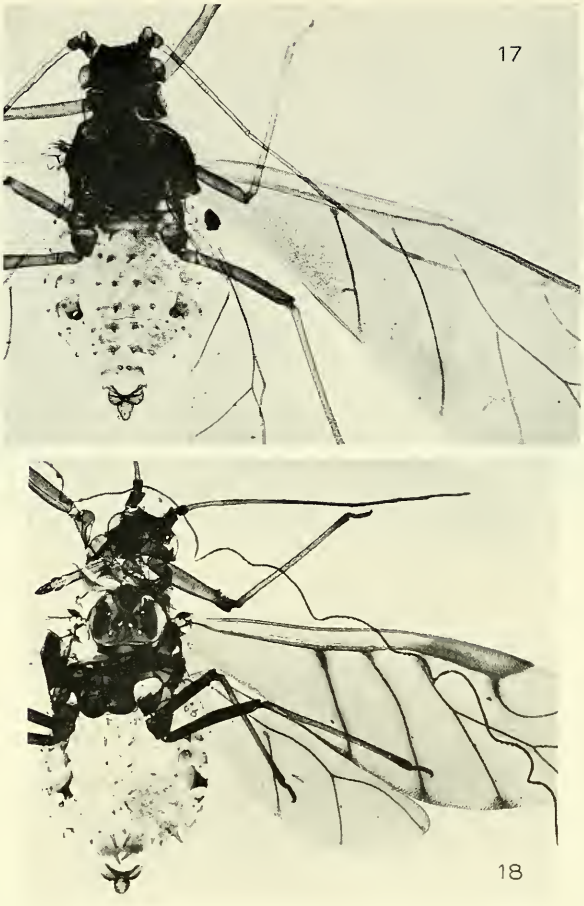

Fig. 17. *N. bulbicauda* spec. nov., alate female, × 27.5. Fig. 18. *N. chilensis* Essig, alate female, × 23

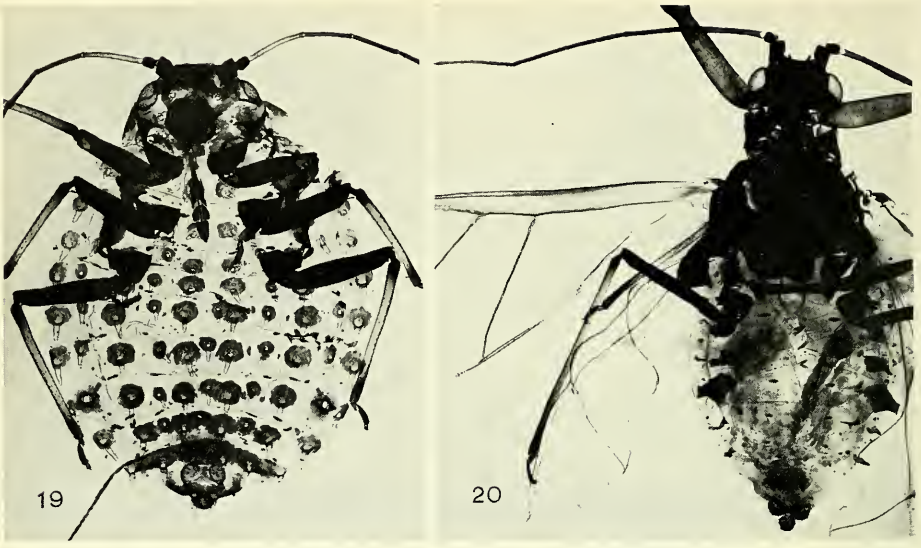

Fig. 19—20. *N. essigi* spec. nov. 19. apterous viviparous female, × 23.5. 20. alate female, × 24

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* Een sterretje duidt een naam aan nieuw voor de wetenschap.
* An asterisk denotes a name new to science.
** Twee sterretjes duiden een naam aan van een soort nieuw voor de fauna.
** Two asterisks denote the name of a species new to the Netherlands fauna.

In dit register zijn niet opgenomen de volgende stukken, die een eigen register hebben op de eronder aangegeven pagina:
From this index are omitted the following papers which have their own index on the page indicated below:

1. N. S. Obraztsov. — Die Gattungen der Palaearktischen Tortricidae II. Die Unterfamilie Olethreutinae, 8. Teil und Schluss, p. 1.
Register/Index: p. 21.

2. Fr. Chrysanthus, O. F. M. Cap. — Spiders from South New Guinea X, p. 49. Familienamen zijn opgenomen. / Family names are included.
Register/Index: p. 70.

3. J. P. van Lith. — Contribution to the knowledge of Indo-Australian, etc., Psenini, etc., p. 89.
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